Bulletin 22, Pt. 2.

DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

JOSEPH A. HOLMES, Director

ANALYSES OF COALS IN THE UNITED STATES

WITH DESCRIPTIONS OF MINE AND FIELD SAMPLES COLLECTED BETWEEN JULY 1, 1904, AND JUNE 30, 1910

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no. 22
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BY

N. W. LORD

WITH CHAPTERS BY

J. A. HOLMES, F. M. STANTON, A. C. FIELDNER,
AND SAMUEL SANFORD

ENGINEERING

Part II. DESCRIPTIONS OF SAMPLES

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DESCRIPTIONS OF MINE AND FIELD SAMPLES COLLECTED BETWEEN JULY 1, 1904, AND JUNE 30, 1910.

INTRODUCTION.

This volume contains the descriptions of the samples whose analyses are published in the preceding volume, Part I of this bulletin. The descriptions have been compiled from the notebooks of the persons who collected the samples, have been condensed from accounts given in published reports of the United States Geological Survey, or have been furnished by the collectors themselves. Inasmuch as the descriptions represent the work of many persons during a period of six years, and inasmuch as they were recorded under widely differing conditions, they necessarily vary in fullness of detail.

The descriptions are published for two purposes: (1) To present such information regarding the character of the coal, the impurities in the beds sampled, and the nature of the roof and the floor of the beds as has a definite bearing on the significance of the analyses of the samples, and (2) to give any supplementary details such as the capacity or the output of a mine, the method of mining and preparing the coal, and the chief uses to which it is put, that may be of assistance to Government engineers or purchasing agents, and to other persons, in preparing specifications and awarding contracts for fuel.

ACKNOWLEDGMENTS.

The general style in which the descriptions are presented was determined by J. A. Holmes, director of the Bureau of Mines.

Grateful acknowledgment is made of the assistance received from many geologists of the Geological Survey. Thanks are tendered in particular to M. R. Campbell, geologist in charge of fuel investigations, for his courtesy in revising the names of coal beds and coal-bearing formations and the classification of the coals.

THE SAMPLING OF COAL IN THE MINE.[a]

By JOSEPH A. HOLMES.

GENERAL STATEMENT.

In planning the fuel-testing investigations of the Geological Survey at St. Louis, Mo., in 1904, the committee having the matter in charge, Messrs. E. W. Parker, M. R. Campbell, and the writer, decided upon a plan of sampling coal in the mine that, it was believed, would satisfy the following requirements: (1) Each group of mine samples submitted for analysis to represent fairly the possible commercial shipments of coal from the mine in which they were collected; (2) the complete history of each sample to be known and recorded; and (3) each sample to be analyzed promptly and by the best standard method.

This plan of collecting mine samples was started during 1904, largely under the personal supervision of Mr. Campbell. With various modifications it has been followed from that time up to the present by those geologists of the survey who, under Mr. Campbell's direction, have been examining the coal deposits on or near the public lands, and by those engineers of the Survey and the Bureau of Mines who, under the direction of the writer, have continued the work of analyzing and testing the coal from the various fields in the United States.

The following statement of the system of mine sampling used by the Geological Survey and the Bureau of Mines has been revised by Messrs. M. R. Campbell and David White, of the Geological Survey, and Mr. G. S. Rice, of the Bureau of Mines.

NEED OF CARE IN SAMPLING.

In dealing with coals no less than dealing with ores, the taking of the sample requires fully as much care as does the making of the analysis or assay. And the difficulties in the way of obtaining at reasonable cost a sample of coal that fairly represents the commercial product as found in the mine or, more especially, as loaded in the cars or in ships, have seriously retarded the movement for the sale or purchase of coal on a rigid specification basis.

The purpose of this chapter is to describe briefly the method followed by the Bureau of Mines and the United States Geological Survey in an endeavor to take mine samples that fairly represent the beds of coal that are examined and that show, for the places sampled, the commercial possibilities of these beds. It is of the utmost importance that the sampling be done in a systematic manner, according to a prearranged plan, and that the same procedure always be followed where circumstances permit. Wherever it is possible, unless special samples are desired for a particular purpose, only clean, fresh coal should be sampled, and all dried, weathered, or long-exposed coal should be avoided. When weathered coal, either in the outcrop or in pillars, or other special samples are collected, the particular characteristics of each sample should be clearly described.

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[a] From Technical Paper 1, Bureau of Mines, 1911.

COLLECTING OUTFIT OR SAMPLING KIT.

The coal-mine sampling outfit used by the Bureau of Mines comprises the following articles: Carrying bag, sampling cloth (heavy oilcloth), portable mortar and pestle, spring balance, screen, sampling scoop, brush, measuring tape, sample cans, adhesive tape, pick, and shovel.

Carrying bag.—The bag used for carrying the sampling outfit and the collected samples is of leather, has a shoulder strap, and measures 13 by 12 by 3 inches.

Sampling cloth.—For collecting the cuttings chipped from the face of a coal a stout sheet or blanket of waterproof material is used. The heavy enamel cloth known as buggy cloth gives good service. The cloth should measure not less than 6 by 7 feet. The enameled side of this cloth should be laid next to the ground to keep out moisture and to prevent fragments of the enamel from getting into the coal sample.

Portable mortar.—A piece of ¾-inch board, 10 inches square, covered on the upper side with heavy galvanized sheet iron, forms the bottom of the portable mortar. The collapsible sides are of stout duck, and are fastened at the top to a strap-iron band that is held up by collapsible strap-iron posts fastened by set screws. The sides are 5 inches high, making the contents of the mortar about 500 cubic inches.

Pestle.—The pestle for crushing samples consists of a steel head, 1 inch thick and 3 to 4 inches square with a screw socket to receive a wood handle about 14 inches long.

Spring balance.—A good spring balance of 50-pounds capacity, graduated preferably to one-half pound, is used for weighing the samples.

Screen.—The screen is of galvanized-iron wire and has a ½-inch, or preferably ⅜-inch, mesh. It is about 10 inches square and has a wood frame.

Sampling scoop.—The scoop recommended is made of heavy galvanized sheet iron, with flat bottom and vertical sides, and is 8 inches long, 2 inches deep, and 1¼ inches wide. If such a scoop is not available, a bricklayer's trowel or even a wooden shingle will answer the purpose.

Brush.—A stiff brush or whisk broom is useful for brushing off loose pieces of coal, stone, or dirt from the face or roof at the place where the sample is to be taken and for removing the rejected quarterings of coal from the sampling blanket. If such a brush is not available, a piece of cloth or an old coat may be used as a substitute.

Measuring tape.—For measuring coal-bed sections a 20-foot waterproof tape graduated to one-fourth inch is used. A steel tape graduated to one-sixteenth inch, though more accurate, is less convenient, because the figures are difficult to read by the poor light available in mines.

Sample can.—The vessel ordinarily used by the Bureau of Mines and by the Geological Survey for transporting coal samples is a 9 by 3 inch round can of No. 27 galvanized iron. The can filled with coal should not weigh more than 4 pounds, which is the limit of weight for ordinary transmission by mail. The edges of the can are crimped and carefully soldered to make them tight and strong; the screw top (2 inches in diameter) has a gasket or washer of rubber or other flexible material to exclude the air. As a further protection, the outside of the cap, when in place and screwed down tightly, is wrapped carefully with several layers of adhesive tape so that the first layer of this tape completely covers the joint between the lower edge of the cap and the neck of the can. It is not advisable to use solder, paraffin, or sealing wax of any kind. Before being filled each can should be carefully inspected as to tightness and freedom from rust.

Adhesive tape.—For sealing the connection of the cap and sample can, bicycle or electrician's adhesive tape of the best quality is used.

Pick and shovel.—Nothing is better than a miner's pick for cutting samples. A miner's shovel should be taken along for cleaning up the floor, etc. Pick and shovel are not regularly included in the kit, as they can be had at any working mine.

The field men of the Geological Survey, because they often work long distances from a base of supplies and travel by horseback, usually carry a simpler outfit than that described above, consisting of a waterproof blanket, a measuring tape, adhesive tape, a screen, a geologist's pick, an improvised shovel, and the necessary number of sample cans. Instead of using a portable mortar and pestle, a man thus equipped must pulverize the coal with his pick, on a board or other hard surface, and instead of a scoop he must use a trowel or shingle. He does not weigh the coal; and instead of using a brush or broom, he removes loose coal, etc., from the face and roof, and cleans the quarterings off the sampling blanket with his coat or a piece of cloth. He will ordinarily use a miner's pick, if found in the mine, instead of his geologist's pick for cutting down the coal.

PRELIMINARY DETAILS.

PROCURING A MAP OF THE MINE.

A map of the mine to be examined should be obtained from the company's office for use in the preliminary examination of the mine and for indicating the exact location at which each sample is to be collected. If the tonnage output of the mine is known, the places for collecting samples should be determined tentatively before entering the mine, the locations to be changed as the work progresses, if such changes prove to be desirable.

EXAMINATION OF THE MINE.

To determine exactly where and how it may be best to collect samples that will satisfactorily represent the character of the coal bed and to ascertain what portion of the bed is excluded in mining and loading, the collector with map in hand should make a preliminary examination of the mine in company with a guide who is familiar with the workings. This examination will enable the collector to select the exact places for collecting samples and to indicate them on his map.

NUMBER OF SAMPLES TO BE COLLECTED.

From any mine shipping coal the number of samples should not be less than four for a daily production of 200 tons or less, and the number should increase at the rate of one sample for each additional 200 tons of coal mined per day. The number should be greater from mines in which the quality of the coal varies greatly. Where only a part of a bed is being mined and the remainder (1 foot or more in thickness) is being left underground, separate samples should be collected at each sampling place of both the worked and the unworked parts or benches of the bed. In sampling coal beds exposed in ordinary prospect openings, where the coal is usually more or less weathered, one sample from each opening is considered sufficient, unless the openings are far apart; in that case occasional second or check samples are highly desirable.

SELECTING PLACES FOR SAMPLING.

Having decided upon the probable number of samples to be collected and approximately where they are to be taken, the collector during his preliminary examination of the mine should decide upon the exact location from which each sample is to be collected, so that it will represent the coal mined in that part of the workings. Furthermore, certain of the samples should be taken from places in the remoter parts of the mine, so that the samples will indicate the character of the coal available for future as well as for present shipments. Exceptional features, such as faults, etc., should be avoided unless special studies of the coal at these places are thought desirable. Where it is possible, wet places should be avoided, as samples from such places may not represent the coal as shipped. Where wet coal must be collected, the surplus moisture should be drained off the sampling cloth before mixing the sample.

METHOD OF SAMPLING.

CLEANING OFF THE FACE OF THE COAL.

At each selected point, before a sample is cut, the face of the bed should be cleared of burned powder, dirt, or loose coal from roof to floor for a width of about 5 feet. This is done to prevent any loose fragments or foreign matter from falling off the face of the coal onto the sampling cloth. Insecure pieces of the roof should be taken down in advance for the same reason. In the middle of this cleared area on the face the coal should be cut away with the pick from the roof to the floor for a width of 1 foot and a depth of at least 1 inch, with a view to removing any discolored, altered, or otherwise inferior coal that might be near the surface, and also to square up this portion of the face in preparation for the sampling cut.

WHAT TO INCLUDE IN THE SAMPLE.

There should go into the sample as it is cut from the face all the material that ordinarily goes into the daily shipments of coal. There should be omitted from the sample only such material as is ordinarily discarded by the miner. Usually partings more than three-eighths of an inch thick and lenses or concretions of "sulphur" or other impurities more than 2 inches in maximum diameter and one-half of an inch thick are excluded, if in the judgment of the sampler they are being excluded by the miner from the coal as loaded out of the mine or as shipped. If such impurities, or other impurities, are not generally excluded by the miner, they should be included in the sample. If pillars are being "pulled," careful note should be made not only of partings, but of materials from the roof that are not rejected by the miner. Where the impurity to be rejected, like bone or slaty coal, does not show conspicuously, it is advisable to outline the impurity with chalk before cutting the sample, to prevent its being overlooked when the sample is being cut.

Imitating the miner in excluding impurities is the best method, but it requires care and judgment, especially where the partings are soft and crumbly. No two miners can be trusted to discard the same partings to the same extent, even at mines where the most rigid regulations for cleaning the coal are in force. Since it is desired to obtain samples that represent as nearly as possible the coal that is produced commercially from the mine under examination, this method should be followed as closely and as uniformly as possible. The carrying out of the method demands experience and the exercise of judgment on the part of the sampler, who must familiarize himself with the impurities in the coal bed and their relation to the coal as shipped.

Where the coal is washed before being shipped, duplicate samples of the washed coal and the tailings should be collected and mailed to the Bureau of Mines with the mine samples.

COLLECTING AND PREPARING THE SAMPLE.

The collector should smooth and clean the floor and spread the sampling cloth on it close to the face of the coal. Then he should make a perpendicular cut 2 inches deep and 6 inches wide (or 3 inches deep and 4 inches wide in the softer coals) from the roof to the floor down the middle of the foot-wide cut previously made in the coal face. He should be careful to make this cut uniform in width and depth and should chip off enough coal to make a sample weighing at least 6 pounds for each foot of the thickness of the bed; so that the sample collected on the blanket from a 6-foot bed will weigh not less than 36 pounds. Inexperienced collectors should weigh their samples (by spring balance or otherwise) as a check on the accuracy of their work.

As soon as the cutting of the sample has been completed, if the full outfit previously described is available, the finer portions of the sample should be put through the ½-inch or ⅜-inch screen and the lumps should be broken in the mortar until all the sample passes through the screen. The sample should then be thoroughly mixed by two men grasping the opposite corners of the blanket and rolling it diagonally by raising one corner at a time. When the larger pieces of coal are evenly distributed throughout the mass, the sheet should be laid on the floor and the top of the pile flattened with a clean dry shovel, trowel, or board. The sample is then quartered and two opposite quarters are discarded and brushed off. The remainder is mixed as before, and if the sample is still too bulky for convenient handling it is again quartered. The material finally remaining is spread in a circular mass about 2 inches deep on the sheet, and the sampling scoop is used to fill the sample can compactly with portions from opposite quarters. The entire operation described above from the cutting of the sample to the sealing of the can should be done in the mine, so as not to expose the coal to the outside atmosphere.

THE CAN SHOULD BE COMPLETELY FILLED.

It is important that the coal be well packed in the can, so as to occupy as much of the space as possible, since in this way the air is more nearly excluded. This is best accomplished by crushing fine a considerable proportion of the coal and by shaking or jarring the can repeatedly and vigorously while filling it.

SEALING THE CAN.

As soon as the can has been filled and the label placed inside, the cap should be screwed on so that the top of the screw fits tightly into the rubber or other flexible material in the cap; adhesive tape should then be carefully wrapped around the lower outer edge of the cap in such a manner as to cover the joint and increase the thoroughness of the sealing.

LABELING.

Each sample can when sent out should have a number printed on it. This number is to be used by the collector as the field number for the sample placed in that can for analysis, and is to be recorded in his notebook and on his cards. Before the can is sealed, a label should be placed in it on the top of the coal. This label should bear the field number, the name and location of the mine, the exact location at which the sample was taken, the name of the collector, and the date, and should be sealed in a small envelope to prevent obliteration of the writing. Around the outside of the can a second label should be attached, bearing the same field number, the name of the collector, the date of the collection, and the address of the Bureau of Mines at Pittsburgh.

NOTES.

To facilitate the gathering and recording of data concerning the samples of coal and the mines from which they are taken, blank forms have been prepared for the use of collectors. These forms can be had upon application to either the Director of the Bureau of Mines or the Director of the Geological Survey. The forms, which are of convenient size for the pocket, indicate what information is desired concerning the nature and operations of the mine, the number, depth, and character of the beds of coal, the specific location from which each sample was taken, and the exact character of the bed at the point of sampling, and make specific mention of bands of "sulphur" (pyrite, etc.), shale, or other objectionable material that should be excluded in shipment.

The record of the coal-sample section should be made in the mine from actual measurements, immediately after the collection of the sample and the sealing of the sample can.

PROMPT FORWARDING AND ANALYSIS OF SAMPLES.

The cans containing the samples should be delivered by the collector in person to the nearest postoffice for forwarding by the first mail to the Bureau of Mines laboratory at Pittsburgh.

It is expected that each sample on its receipt at the laboratory will be placed in a dark, cool place, and that the analysis will be completed within two weeks.

DESCRIPTIONS OF SAMPLES.

The following descriptions of mines and samples are arranged in the same order as the analyses published in Part I of this bulletin. Attention is called to the fact that the coal sections which the samples represent are described in the terms used by the collectors of the samples, except that "shale" has been substituted for "slate" and "bony coal" or "bone" for "bone coal." The classification of the coals as anthracite, semianthracite, semibituminous, bituminous, subbituminous, and lignite is based on the findings of the United States Geological Survey, as is the nomenclature of the coal fields and the geologic formations.

ALABAMA.

BIBB COUNTY.

Belle Ellen. Belle Ellen No. 2 Mine.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 9254, 9255 (p. 33).

Mine.—Belle Ellen No. 2; a slope mine in sec. 15, T. 22 S., R. 5 W., at Belle Ellen, on the Louisville & Nashville Railroad.

Coal bed.—Coke (or Youngblood). Carboniferous age, Pottsville group. Thickness, uniform; dip, 17° W., diminishing to 8° at lower end of slope; roof, gray shale, 50 feet, overlain with 50 feet of coarse sandstone; floor, clay, 1 foot, underlain with shale; cover, 100 to 500 feet.

The bed was measured and sampled at two points in the mine by Charles Butts, on October 25, 1909, as described below:

Sections of coal bed in Belle Ellen No. 2 mine at Belle Ellen.

Section	A		B	
Laboratory No	9254		9255	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Rash [a]	0	6	0	2
Coal	2	9	4	7
Floor, clay.				
Thickness of bed	3	3	4	9
Thickness of coal sampled	2	9	4	7

[a] Not included in sample.

Section A (sample 9254) was measured at the face of north heading 8, about 2,000 feet west of the slope mouth.

Section B (sample 9255) was measured in room 33 off south heading 9, about 2,000 feet west of the slope mouth.

Notes.—The coal from this mine has about the usual hardness of bituminous coal but is badly shattered when mined by shooting off the solid. In consequence the mine at the time when the samples were collected yielded much slack. The "rash" immediately over the coal and the soft shale in the roof mingled with the coal to such an extent that washing was necessary; this removed 8 to 10 per cent of the total output of the mine, including impurities and slack. Much of the output was used by locomotives.

For chemical analyses of this coal see part I of this bulletin, p. 33.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 120.

BELLE ELLEN. CANE CREEK NO. 2 MINE.

Sample.—Bituminous coal, Cahaba field; (Alabama No. 4) analyses Nos. 3034, 3035 (p. 33).

Mine.—Cane Creek No. 2; 3 miles north of Belle Ellen, on the Louisville & Nashville Railroad.

Coal bed.—Youngblood (or Coke). Carboniferous age, Pottsville group. Thickness, 2 feet to 3 feet 6 inches, averaging 2 feet 10 inches; free from partings; dip, about 14° SE.; roof, in many places soft shale, 3 to 4 inches thick, with hard shale above; in places the soft shale is absent; floor, soft gray fire clay.

The bed was measured and sampled at two places by J. W. Groves and W. J. Von Borries on March 14, 1906.

Sample 3034 was taken in room 26, off heading 6, 900 feet northeast of slope, where the coal was 2 feet 10 inches thick.

Sample 3035 was taken in room 19, off entry 9, 1,500 feet northeast of slope, where the coal was 2 feet 11 inches thick.

Notes.—The coal is firm. The approximate output in 1906 was 500 tons daily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 53; Bureau of Mines Bull. 23, pp. 58, 145; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 54; Bureau of Mines Bull. 13, pp. 103, 272; briquetting tests: U. S. Geol. Survey Bull. 332, p. 56; washing tests: U. S. Geol. Survey Bull. 332, p. 54; Bull. 336, p. 13; coking tests: U. S. Geol. Survey Bull. 332, p. 54; Bull. 336, pp. 21, 27, 36; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 55; Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses see part I of this bulletin, p. 33; also U. S. Geol. Survey Bull. 332, p. 53.

BLOCTON. BLOCTON NO. 7 MINE.

Sample.—Bituminous coal; Cahaba field; (Ann Arbor No. 8) analyses Nos. 7394, 7395 (p. 33).

Mine.—Blocton No. 7; Birmingham district; a slope opening, 1¼ miles east of Blocton, on the Mobile & Ohio Railroad.

Coal bed.—Thompson (Underwood). Carboniferous age, Pottsville group. Thickness, about 5 feet 5 inches; roof, bone coal about 5 inches thick; floor, sandstone, beneath which is fire clay.

The bed was measured and sampled at two points in the mine by P. M. Riefkin on March 9, 1909, as shown below:

Sections of coal bed in Blocton No. 7 mine, 1¼ miles east of Blocton.

Laboratory No.	7394		7395	
	Ft.	*in.*	*Ft.*	*in.*
Roof, bony coal.				
Rash[a]	0	3¾	0	3
Coal	4	8¾	0	11¼
Mother coal	0	1	..	...
Bony coal	..	..	0	½
Coal	..	..	0	8½
Bony coal[a]	..	..	0	¾
Coal	..	..	0	9
Bony coal[a]	..	..	0	¼
Coal	..	..	2	7
Floor, sandstone.				
Thickness of bed	5	1½	5	4¾
Thickness of coal sampled	4	9¾	5	¾

[a] Not included in sample.

Sample 7394 was dry when taken; it was measured 1¼ miles east of opening, in cross entry 6, off east heading 14.

Sample 7395 was wet when taken; it was measured in room 9, off left cross heading, off east entry 2.

Notes.—In 1910, when the samples were collected, the condition of the mine and the machinery equipment was good. The mine shipped three sizes of coal; all that passed through 1-inch perforations was designated nut coal and slack; all over 1-inch and under 5-inch, fancy lump. The daily output was 550 tons; the capacity was about 800 tons.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 31, 47.

For chemical analyses see part I of this bulletin, p. 33.

GARNSEY. NO. 1 MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 3018, 3019, (Alabama No. 3), and analyses Nos. 9249, 9250, 9251 (pp. 33, 34).

Mine.—No. 1; a slope mine, in sec. 7, T. 22 S., R. 4 W., at Garnsey, on the Louisville & Nashville Railroad.

Coal bed.—Thompson. Carboniferous age, Pottsville group. Thickness, fairly uniform, averaging 5 feet 6 inches; dip, 11° to 17° NE.; roof, hard sandy shale, or sandstone and conglomerate; floor, soft fire clay, or "rash" (fire clay mixed with carbonaceous material). The bed in this mine carries a persistent shale parting.

The bed was measured and sampled by J. W. Groves and W. J. Von Borries, March 12, 1906, as shown below:

Sections of coal bed in No. 1 mine at Garnsey.

Section	A		B	
Laboratory No	3018		3019	
Roof, hard shale, or sandstone.	Ft.	in.	Ft.	in.
Coal	1	9	3	0
Mother coal	0	½	..	..
Shale [a]	..	..	0	11
Coal	1	0	1	9
Shale [a]	0	9	..	..
Sulphur and shale [a]	0	2	..	..
Coal	1	3	..	..
Floor, fire clay.				
Thickness of bed	4	11½	5	8
Thickness coal sampled	4	½	4	9

[a] Not included in sample.

Section A (sample 3018) was taken 2,700 feet south of slope, in east cross entry 8.

Section B (sample 3019) was taken in room 2, off west entry 7, 2,500 feet southwest of the slope opening.

The bed was also measured and sampled at two points by Charles Butts on October 22, 1909, as described below:

Sections of coal bed in No. 1 mine at Garnsey.

Section	A		B			
Laboratory No	9249		9251		9250	
Roof, shale.	Ft.	in.	Ft.	in.	Ft.	in.
Rash	..	..	0	4	..	..
Coal	[a] 2	8½	0	7	2	8½
Bone	..	..	0	1½	..	..
Coal	..	..	1	9	..	..
Clay	[a] 1	0	0	9½	1	0
Coal	1	10	2	6	1	10
Floor, shale.						
Thickness of bed	5	6½	6	1	5	6½
Thickness of coal sampled	1	10	5	3½	2	8½

[a] Not included in sample.

Section A (sample 9249) from the lower bench, 1 foot 10 inches thick, and sample 9250, from the upper bench, 2 feet 8½ inches thick, were measured at the face of east heading 9, 2,000 feet east of slope mouth.

Section B (sample 9251) was measured at the face of west heading 8, about 2,000 feet from the slope mouth.

Notes.—The coal from this mine has good hardness. When the mine was sampled in 1909 the coal was used for steam and domestic purposes. It was screened into lump, nut, and pea sizes. All coal passing over a 4 by 8 inch screen was designated lump. All passing over a 3½-inch screen was designated nut, and all passing through a 3½-inch screen was washed and afterwards passed to a revolving screen with 2-inch mesh. All passing over this screen went with the nut and all passing through was classed as pea coal. The proportions were 12 per cent lump, 68 per cent nut, and 20 per cent pea.

For results of tests of this coal, see mention of specific tests, as follows—steaming tests: U. S. Geol. Survey, Bull. 332, p. 51; Bureau of Mines Bull. 23, pp. 58, 145; washing tests: U. S. Geol. Survey Bull. 332, p. 51; coking tests: U. S. Geol. Survey Bull. 332, p. 51; Bull. 336, pp. 21, 27, 36; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 52; Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses see part I of this bulletin, p. 33. Also U. S. Geol. Survey Bull. 332, p. 50.

For geologic relations see U. S. Geol. Survey Bull. 431, pp. 91, 134.

MARVEL. DALEY MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 9666 (p. 34).

Mine.—Daley; in sec. 6, T. 22 S., R. 4 W., near Marvel.

Coal bed.—Coke (Youngblood). Carboniferous age, Pottsville group. Thickness, uniform; dip 20° E. The roof is shale and the floor is sandstone.

The bed was measured and sampled on December 3, 1909, by Charles Butts. The sample represented a 3½-foot cut of coal and was taken 100 feet north of main slope, 300 feet from mouth.

Notes.—New mine at time of sampling. Coal used for steaming purposes.

For chemical analyses of this coal, see part I of this bulletin, p. 34.

For geologic relations see U. S. Geol. Survey Bull. 431, pp. 121, 144.

MARVEL. MARVEL MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 10461, 10460, 10465, 10484, 10462, 10463, 10464, 10485, 9252, 9253 (p. 34).

Mine.—Marvel; a slope mine in sec. 7, T. 22 S., R. 4 W., at Marvel, on the Louisville & Nashville Railroad and the Southern Railway.

Coal bed.—Clark (Blocton No. 1, Buck, Woodstock) and Black Shale (Gholson). Carboniferous age, Pottsville group. The beds dip 15° E.; thickness, uniform; roof of Buck (Clark) bed, 1½ feet of shale or 25 feet of sandstone; floor, clay underlain with shale; roof of Black Shale (Gholson) bed, 10 feet of shale; floor, 6 feet of shale underlain with sandstone.

The bed was measured and sampled on October 22, 1909, by Charles Butts and on April 30 and May 12, 1910, by J. J. Rutledge, as described below:

Sections of coal bed in Marvel mine at Marvel.

Laboratory No.	10465		10464		10460		10461		10462		10463		9252		9253	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7¾	0	7	0	7	0	8	2	8½	3	6	2	10	3	1
Gray shale [a]	0	1	..	..	0	2½	..	..	..	..	0	¾	..	..	..	..
Mother coal	..	..	0	½	..	..	..	..	..	..	..	..	..	..	..	..
Coal	3	3½	3	0	3	½	..	..	..	..	..	..	..	..	..	..
Clay [a]	..	..	..	..	..	..	..	..	..	..	..	..	0	1	..	..
Dark-gray shale [a]	..	..	0	¾	..	..	0	5	0	½	..	..	..	..	..	..
Coal	..	..	0	4	..	..	3	9	0	8	0	3½	0	7½	..	..
Clay [a]	..	..	..	..	..	..	..	..	..	..	..	..	0	1	..	..
Coal	..	..	..	..	..	..	..	..	..	..	..	..	0	4½	..	..
Floor, shale.																
Thickness of bed	4	¼	4	¼	3	10	4	10	3	5	3	10¼	4	0	3	1
Thickness of coal sampled	3	11¼	3	11½	3	7½	4	5	3	4½	3	9½	3	10	3	1

[a] Not included in sample.

Sample 10465 was taken in room 1, left heading 2, slope 2, Black Shale (Gholson) (lower) bed.

Sample 10464 was taken in face of slope, air course, Buck (Clark) (upper) bed.

Sample 10460 was taken in face of right heading 2, slope 2, Black Shale (Gholson) (lower) bed.

Sample 10461 was taken in slope 2, left heading 1, room 18, Black Shale (Gholson) (lower) bed.

Sample 10462 was taken in face of left heading 2, off slope 1, Buck (Clark) (upper) bed.

Sample 10463 was taken in face of left slope 3, off main slope, Buck (Clark) (upper) bed.

Sample 9252 was taken from Black Shale (Gholson) bed in slope 1 at face of right heading 1,200 feet south of mine mouth.

Sample 9253 was taken at face of left heading 1 (slope 2, Clark bed).

A composite sample was made by mixing the face samples 10460, 10461, and 10465 for an ultimate analysis, the results of which are shown under laboratory number 10484; a composite sample was also made by mixing face samples 10462, 10463, and 10464 for an ultimate analysis, the results of which are shown under laboratory number 10485.

Notes.—The coal from this mine is firm. At time of sampling the output was used for domestic purposes and for steam production. The capacity of the mine was 500 tons daily.

For chemical analyses of this coal, see part I of this bulletin, pp. 34, 35; also U. S. Geol. Survey Bull. 431, p. 144.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 91.

PIPER. PIPER NO. 1 MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 9243, 9244 (p. 35).

Mine.—Piper No. 1; sec. 2, T. 24 N., R. 10 E., at Piper, on the Louisville & Nashville Railroad and the Southern Railway.

Coal bed.—Thompson (or Underwood). Carboniferous age, Pottsville group. Thickness, uniform; dip, 12° E.; roof, calcareous shale; floor, sandstone; cover, 50 to 500 feet.

The bed was measured and sampled at two points by Charles Butts on October 20, 1909, as described below:

Sections of coal bed in Piper No. 1 mine at Piper.

Section	A		B	
Laboratory No.	9243		9244	
Roof, gray calcareous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Rash [a]	..	..	0	1
Coal, bony [a]	0	4	0	5
Rash [a]	..	..	0	6
Coal, mostly very hard	5	0	4	8
Floor, sandstone.				
Thickness of bed	5	4	5	8
Thickness of coal sampled	5	0	4	8

[a] Not included in sample.

Section A (sample 9243) was measured at the face of the east heading 15, 3,500 feet from the slope mouth.

Section B (sample 9244) was measured at the face of the west heading 15, 3,500 feet from the slope mouth.

Notes.—The coal at this mine was hard and bright; much slickensided; cleat destroyed; breaks into lumps with rounded contours and gnarly aspect. In 1909, when these samples were taken, it was mostly used for domestic purposes. The roof was bad, slacking and caving in the main slope and headings. The production in 1909 was 90,822 short tons. Output in 1910, 103,773 tons.

For chemical analyses of this coal see part I of this bulletin, p. 35; also U. S. Geol. Survey Bull. 431, p. 144.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 91.

BLOUNT COUNTY.

LEHIGH. NO. 2 MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 4090, 4091 (p. 35, Alabama No. 5).

Mine.—No. 2; Birmingham district; drift mine at Lehigh on the Louisville & Nashville Railroad.

Coal bed.—Black Creek. Carboniferous age, Pottsville group. Bed lies nearly horizontal and was opened by a drift at a depth of 80 feet. It is from 2 feet to 2 feet 8 inches thick, averaging 2 feet 4 inches. In places there is 6 to 18 inches of "black rash" or shale and coal above the bed; in places the sandstone that overlies the bed for 80 feet forms the roof. The floor is a commercial fire clay, 5 feet thick.

The bed was measured and sampled by K. M. Way and A. K. Adams on November 17, 1906, at points showing the following measured sections:

Sections of coal bed in No. 2 mine at Lehigh.

Section	A		B	
Laboratory No.	4090		4091	
Roof: Section A, 18 inches "rash," with shale above; section B, 14 inches "rash," with shale above.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	1	5
Mother coal [a]	0	⅛	0	½
Coal	0	3½	0	11
Floor, fire clay.				
Thickness of bed	1	11⅝	2	4½
Thickness of coal sampled	1	11½	2	4

[a] Not included in sample.

Section A (sample 4090) was taken from left cross entry 9, 2,000 feet south of drift mouth.

Section B (sample 4091) was taken from right entry 10, 2,100 feet south of drift mouth.

Notes.—The coal is bright, friable, clean, and seemingly free from sulphur balls. The output of the mine in 1906 was 350 tons daily. At the time the mine was visited in 1906 the clay floor was being shot up and shipped to a tile factory. The output in 1910 was 65,731.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 57; Bureau of Mines Bull. 23, pp. 58, 146; washing tests: U. S. Geol. Survey Bull. 332, p. 57; Bull. 336, pp. 13, 16; coking tests: U. S. Geol. Survey Bull. 336, pp. 21, 27, 36.

For chemical analyses, see part I of this bulletin, p. 35; also U. S. Geol. Survey Bull. 332, p. 57.

SWANSEA (INLAND). FAIRCHILD MINE.

Sample.—Bituminous coal; Plateau field; analysis No. 2191 (p. 35).

Mine.—Fairchild; Birmingham district; in sec. 5, T. 14 S., R. 1 E., at Swansea (Inland), on the Louisville & Nashville Railroad.

Coal bed.—Swansea, or Rosa of the U. S. Geological Survey, also called Jagger by mining companies. The coal is of Carboniferous age, Pottsville group. The bed lies nearly flat, has a gray shale roof and sandstone floor; cover, 200 feet thick.

The bed was measured and sampled by T. M. Campbell in September, 1905, as described below:

Section of coal bed in Fairchild mine at Swansea (Inland).

Laboratory No	2191	
	Ft.	*in.*
Coal	3	7
Bone [a]	0	2
Coal	1	2
Floor, sandstone.		
Thickness of bed	4	11
Thickness of coal sampled	4	9

[a] Not included in sample.

The section (sample 2191) was taken 450 feet south of the drift mouth.

Notes.—In 1909 the coal was sold in run-of-mine form.

For chemical analyses of this coal see part I of this bulletin, p. 35.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 400, p. 170.

JEFFERSON COUNTY.

ADGER. BLUE CREEK NO. 3 MINE.

Sample. Bituminous coal; Warrior field; analyses Nos. 1145, 1149 (p. 35).

Mine.—Blue Creek No. 3; a slope mine in the Birmingham district at Adger, on the Louisville & Nashville Railroad.

Coal bed.—Blue Creek; Carboniferous age, Pottsville group. Thickness, somewhat variable; dip at entrance, 15° SE.; roof, gray shale; floor, clay, underlain with shale; cover, 200 to 500 feet.

The bed was measured and sampled at two points by Charles Butts on September 7, 1904, as described below:

Sections of coal bed in Blue Creek No. 3 mine at Adger.

Section	A		B	
Laboratory No	1145		1149	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4	1	5
Parting	..	..	0	¼
Coal	..	..	0	5
Parting	..	..	0	¼
Clay [a]	1	¼	..	..
Coal	1	5½	1	6½
Shale [a]	..	..	0	1
Coal	..	..	0	4¾
Parting [a]	..	..	0	1
Clay [a]	0	10½	..	..
Coal	2	0	1	½
Shale [a]	0	¾	0	2
Coal	1	3½	0	5½
Shale [a]	0	½	0	½
Coal	0	5¼	0	5
Clay [a]	0	2	0	2
Coal	0	3¾	0	10
Clay [a]	0	2	0	1
Coal	1	0	0	6
Clay [a]	0	2	..	..
Coal	0	6	..	..
Floor, clay or shale.				
Thickness of bed	10	10	7	8¼
Thickness of coal sampled	8	4	7	¾

[a] Not included in sample.

Section A (sample 1145) was measured in east heading 5, 2,000 feet or more southeast of slope mouth.

Section B (sample 1149) was measured in room No. 7 off right heading 3 on the west cross slope, a long distance from the slope mouth.

Notes.—Coal of usual hardness. Excellent coking coal, but requires washing. Most of output in 1909 made into coke.

For chemical analyses of this coal see part I of this bulletin, p. 35; also U. S. Geol. Survey Prof. Paper 48, p. 40; Bull. 260, p. 379.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361.

CARDIFF. NO. 16 MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1917, 1918, 1920, 1931 (p. 35).

Mine.—No. 16; Birmingham district; a drift mine, in sec. 16, T. 16 S., R. 4 W., 1 mile west of Cardiff, on the Southern Railway.

Coal bed.—Pratt and Nickel Plate beds. The coal is of Carboniferous age, Pottsville group. The coal in the Nickel Plate bed is uniform in thickness and at point sample was taken measured 3 feet 5¼ inches; roof, shale overlain with sandstone; floor, fire clay; cover, 100 to 150 feet. The Pratt bed is uniform in thickness and averages 3½ feet thick; roof, shale overlain with sandstone; floor, slate; cover, 50 to 150 feet.

The beds were measured and sampled by Charles Butts in June, 1905, as described below:

Section of Pratt coal bed in No. 16 mine, 1 mile west of Cardiff.

Section	A		B	
Laboratory No.	1917		1918	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	4½	0	5
Bone[a]	0	2¼	0	2½
Coal	2	10½	2	11
Floor, slate.				
Thickness of bed	3	5¼	3	6½
Thickness of coal sampled	3	3	3	4

[a] Not included in sample.

Section A (sample 1917) was measured in face heading 3 at the mouth of left heading 4.

Section B (sample 1918) was measured in right heading 5, off entry 3.

Section of Nickel Plate coal bed in No. 16 mine, 1 mile west of Cardiff.

Laboratory No.	1920, 1931	
	Ft.	*in.*
Roof, gray shale overlain with sandstone.		
Coal	[a] 1	5¾
Parting	0	½
Coal	[b] 1	3
Shale	0	6
Coal, not mined	0	2
Floor, fire clay.		
Thickness of bed	3	5¼

[a] Included in sample 1920.

[b] Included in sample 1931.

The section was measured and samples taken in right heading 5 of entry No. 1. Sample 1920 was taken from the top bench of 1 foot 5¾ inches, and sample 1931 from the lower bench of 1 foot 3 inches.

Notes.—There were a number of entries into each bed, around the head of a ravine. The coal was all dumped at the same tipple. Coal has the usual characteristics of the Nickel Plate bed in this region.

For chemical analyses of this coal see part I of this bulletin, p. 35; also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

Clift. Clift Mine.

Sample.—Bituminous coal; Warrior field; analysis No. 1754 (p. 36).

Mine.—Clift, a drift mine in sec. 22, T. 16 S., R. 3 W., at Clift station, on the Louisville & Nashville Railroad.

Coal bed.—Pratt. Carboniferous age. Pottsville group. Thickness, uniform, nearly flat; roof and floor, shale; cover, 50 to 100 feet.

The bed was measured and sampled at one point by Charles Butts on June 23, 1904, as described below:

Section of coal bed in Clift mine at Clift.

Laboratory No	1754	
Roof, shale.	*Ft.*	*in.*
Coal	0	7
Bone [a]	0	3½
Coal	2	4½
Floor, shale or sandstone.		
Thickness of bed	3	3
Thickness of coal sampled	2	11½

[a] Not included in sample.

The section (sample 1754) was measured on main entry at No. 3 cut, about 800 feet from the drift mouth.

Notes.—The coal is firm and bright, with well-developed cleat. Sold as run-of-mine for steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 36; also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

Dolomite. No. 2 Mine.

Sample.—Bituminous coal; Warrior field; analyses Nos. 3579, 3580, 4292, 4293 (p. 36).

Mine.—No. 2; a slope mine in the Birmingham district at Dolomite, on the Woodward Iron Co. Railway.

Coal bed.—Pratt. Carboniferous age, Pottsville group. Thickness, uniform; dip, very steep to west at entrance, becomes nearly flat in mine; cover, 400 feet.

The bed was measured and sampled at two points by Wm. F. Prouty on August 15, 1906, as described below:

Sections of coal bed in No. 2 mine at Dolomite.

Laboratory No	3579		3580	
	Ft.	*in.*	*Ft.*	*in.*
Coal (rather soft)	1	0	0	10
Shale [a]	0	2	0	3
Coal	3	9	3	4
Shale [a]	0	3	0	3
Coal	1	8	1	6
Thickness of bed	6	10	6	2
Thickness of coal sampled	6	5	5	8

[a] Not included in sample.

The points in the mine at which the samples were taken were not adequately described.

The bed was also measured and sampled by K. M. Way on December 6, 1906, at two places, as described below:

Sections of coal bed in No. 2 mine at Dolomite.

Section	A	B
Laboratory No.	4292	4293
Roof, shale.	*Ft. in.*	*Ft. in.*
Coal	0 8½	0 8½
Bastard coal [a]	0 2	.. ..
Bone [a]	0 5¾	0 2¼
Bastard coal [a]	.. ..	0 2½
Coal	2 ¾	2 ½
Mother coal [a]	0 ¼	0 ¼
Coal	1 3	1 6¼
Floor, shale.		
Thickness of bed	4 8¼	4 8¼
Thickness of coal sampled	4 ¼	4 3¼

[a] Not included in sample.

Section A (sample 4292) was measured in room 30, off west heading 31, 2 miles southeast of the slope.

Section B (sample 4293) was measured in east heading 29, 2 miles east of mouth of the slope.

Notes.—The coal from the Pratt bed makes good coke, and the output in 1906 was made into coke at the company's furnaces. The mine is an old one, and its capacity in 1906 was about 1,100 tons of coal daily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 59; Bureau of Mines Bull. 23, pp. 58, 146; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 59; Bureau of Mines Bull. 13, pp. 104, 272; washing tests: U. S. Geol. Survey Bull. 332, p. 60; Bull. 336, pp. 13, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 60; Bull. 336, pp. 21, 27, 36.

For chemical analyses see part I of this bulletin, p. 36; also U. S. Geol. Survey Bull. 332, p. 58.

HENRYELLEN. NO. 6 MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3460 (p. 36).

Mine.—No. 6; 2 miles southwest of Henryellen, on the Southern Railway.

Coal bed.—Mammoth. Carboniferous age, Pottsville group; dip, 32° E.; roof, clay, overlain with sandstone; cover, 200 to 400 feet.

The bed was measured and sampled by C. W. Washburne on July 17, 1906, as described below:

Section of coal bed in No. 6 mine at Henryellen.

Laboratory No.	3460
Roof, clay.	*Ft. in.*
Coal	4 0
Clay [a]	0 2
Coal	1 0
Thickness of bed	5 2
Thickness of coal sampled	5 0

[a] Not included in sample.

Notes.—Coal used for steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 36; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

JOHNS. JOHNS MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1146, 1148 (p. 36).

Mine.—Johns, Little Basin; a slope mine in the Birmingham district at Johns.

Coal bed.—Blue Creek. Carboniferous age, Pottsville group. Dip 40° at outcrop; roof, shale; floor, shale; cover, 400 feet.

This bed was measured and sampled at two points by E. F. Burchard on September 26, 1904, as described below:

Sections of coal bed in Johns mine at Johns.

Section	A		B	
Laboratory No.	1148		1146	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	7	..	..
Shale [a]	0	¾	..	..
Coal	1	5	2	1½
Shale [a]	0	½	0	1½
Coal	1	10½	2	2½
Shale [a]	0	½	0	1
Coal	0	5	0	6
Shale [a]	0	1¼	0	2
Coal	0	9¾	0	9
Shale [a]	0	2	0	2
Coal	0	10	0	5
Rash [a]	..	..	0	5
Shale [a]	0	1½	..	..
Coal	0	5	0	4½
Shale [a]	0	1	0	¾
Coal	0	8	1	1
Floor, shale.				
Thickness of bed	7	7¾	8	5¾
Thickness of coal sampled	6	5¼	7	6½

[a] Not included in sample.

Section A (sample 1148) was measured in room 30 off east heading 3, 1,600 feet east of the slope mouth.

Section B (sample 1146) was measured in room 12 off the 11th east heading from the Ramsay slope, 5,800 feet south of the slope mouth.

Notes.—Coal of usual hardness. Makes good coke, but requires washing. Most of output made into coke.

For chemical analyses of this coal see part I of this bulletin, p. 36; also U. S. Geol. Survey Prof. Paper 48, p. 40.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 374.

LEWISBURG. MARY LEE MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 2431, 2432 (p. 36).

Mine.—Mary Lee; a slope mine in sec. 1, T. 17 S., R. 3 W., at Lewisburg.

Coal bed.—Mary Lee. Carboniferous age, Pottsville group. Thickness uniform; dip, 15° W. at entrance; roof, gray shale; floor, shale; cover, 100 to 500 feet.

The bed was measured and sampled at one point by Charles Butts on October 4, 1905, as described below:

Section of coal bed in Mary Lee mine at Lewisburg.

Laboratory No.	2431, 2432	
Roof, shale.	*Ft.*	*in.*
Bone [a]	0	3
Coal	0	5
Clay, with pyrite [a]	0	11½
Coal	0	3½
Rash, with pyrite [a]	0	½
Coal	0	6½
Parting (pyritic) [a]	0	1
Coal	0	3
Rash [a]	0	½
Coal	0	6
Shale [a]	0	6
Coal, bony	0	10
Coal	3	2
Shale [a]	1	0
Coal (not mined) [a]	0	6
Floor, shale.		
Thickness of bed	9	4½

[a] Not included in sample.

The section was measured in bottom of manway, about 3,000 feet from slope mouth.

Sample 2431 was taken at bottom of main slope from bottom bench of 38 inches.

Sample 2432 was taken at bottom of main slope from part above the bottom bench, 24-inch cut.

Notes.—Coal requires washing; mostly used for coke.

For chemical analyses of this coal see part I of this bulletin, p. 36; also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

LITTLETON. THOMAS MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1919, 1930, 1989, 1990 (p. 37).

Mine.—Thomas; a slope mine in sec. 6, T. 16 S., R. 4 W., at Littleton, on the Southern Railway.

Coal bed.—Mary Lee. Carboniferous age, Pottsville group. Thickness, uniform, much parted by clay or shale; dip, 7° E.; roof, shale, overlain with sandstone; floor, shale; cover, 100 to 500 feet.

The bed was measured by Charles Butts and sampled by T. M. Campbell in June, 1905, as described below:

Section of coal bed in Thomas mine at Littleton.

Laboratory No.	1930	
	Ft.	*in.*
Roof, shale.		
(1) Coal	1	0
(2) Parting [a]	0	1
(3) Coal	0	6
(4) Parting [a]	0	5
(5) Coal	1	7
(6) Parting (bone) [a]	0	¾
(7) Coal	0	5½
(8) Clay [a]	1	7
(9) Coal	2	2½
(10) Shale [a]	0	1½
(11) Coal	0	8½
(12) Shale [a]	0	4
(13) Coal (not mined) [a]	0	5½
Floor, shale.		
Thickness of bed	9	6¼
Thickness of coal sampled	6	5½

[a] Not included in sample.

The section was measured at room 1, left cross heading 10, except top bench of 19 inches, which was measured at left heading 9.

Samples 1919, 1989, 1990 were taken from top, lower, and middle benches, respectively, in left heading 9; sample 1930 was taken from the whole bed at left heading 10.

Sample 1919 represented an 18-inch cut and included (1) and (3) of the section.

Sample 1990 represented a 19-inch cut and included (5) and (7) of the section.

Sample 1989 represented a 35-inch cut and included (9) and (11) of the section.

Notes.—Coal is firm. Used in Alabama and neighboring States as steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 37; also U. S. Geol. Survey Bull. 285, p. 221.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 212.

LOVICK. RUTLIFFE MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3499 (p. 37).

Mine.—Rutliffe; 2¼ miles southwest of Lovick.

Coal bed.—Gould. Carboniferous age, Pottsville group. Thickness, variable; dip, 10° E.

The coal was measured and sampled at one point by William F. Prouty on July 31, 1906, as described below:

Section of coal bed in Rutliffe mine, near Lovick.

Laboratory No.	3499	
	Ft.	*in.*
Coal	0	6
Hard layer	0	⅕
Coal	1	9
Thickness of bed	2	3⅕
Thickness of coal sampled	2	3⅕

Notes.—In 1906, when the sample was collected, this was a small mine or country bank supplying coal to the brickworks at Lovick, the coal being hauled in wagons.

For chemical analyses of this coal see part I of this bulletin, p. 37; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

MINERAL SPRINGS. KOSMO MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1768 (p. 37).

Mine.—Kosmo; a drift mine in sec. 17, T. 16 S., R. 3 W., in the Birmingham district, ½ mile north of Mineral Springs, on the Louisville & Nashville Railroad.

Coal bed.—Nickel Plate. Carboniferous age. Pottsville group. Thickness, uniform; dip, flat; roof, sandstone; floor, fire clay; cover, 50 to 100 feet.

This bed was measured and sampled by Charles Butts on June 29, 1905, as described below:

Section of coal bed in Kosmo mine at Mineral Springs.

Laboratory No.	1768	
Roof, sandstone.	*Ft.*	*in.*
Coal	1	7
Bone[a]	0	1½
Coal	1	0
Floor, fire clay.		
Thickness of bed	2	8½
Thickness of coal sampled	2	7

[a] Not included in sample.

Section (sample 1768) was measured in room 3 off right heading 2, about 600 feet from the drift mouth.

Notes.—Coal firm; used for steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 37; also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 285, p. 212.

MULGA. MULGA MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 10507, 10509, 10513 (p. 37).

Mine.—Mulga; Birmingham district; a shaft mine at Mulga, Jefferson County, on the Atlanta, Birmingham & Atlantic Railway.

Coal bed.—Known in this field as the Pratt. Carboniferous age, Pottsville group. Average thickness, 4 feet 3 inches; roof, slate with smooth surface; floor, clay.

The bed was measured and sampled at two points by J. J. Rutledge on May 4, 1910, as described below:

Sections of coal bed in Mulga mine at Mulga.

Section	A		B	
Laboratory No.	10507		10509	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in*
Coal	0	6	0	4¾
Dark shale [a]	0	1½	0	2
Bone [a]	0	1½	..	..
Coal	2	5	2	7
Hard dark shale [a]	0	6	0	6½
Coal	0	8	0	7½
Floor, clay.				
Thickness of bed	4	4	4	3¾
Thickness of coal sampled	3	7	3	7¼

[a] Not included in sample.

Section A (sample 10507) was cut from face of last crosscut in right entry 1, off left entry 1.

Section B (sample 10509) was cut from face of room 1, off left entry 1, off north heading.

A composite sample was made by mixing samples 10507 and 10509 for an ultimate analysis, the results of which are shown under laboratory number 10513.

Notes.—In 1910, when these samples were collected, the coal in this mine was undercut both by electric chain cutting machines and by hand pick. The steel tipple was equipped with shaker screens. The coal is fairly hard and bright in appearance. It produces large lumps. The bed produced the standard coking coal of the Birmingham district. The daily output in 1910 was from 500 to 600 tons, but the mine was comparatively new. The output was expected to be rapidly increased. The equipment of the mine was sufficient to obtain an output of from 1,200 to 1,500 tons per day from one shaft.

For chemical analyses of this coal see part I of this bulletin (p. 37).

PALOS. PALOS MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 10505, 10506, 10514 (p. 37).

Mine.—Palos, Birmingham district, a drift and slope mine, at Palos, on the St. Louis & San Francisco Railway.

Coal bed.—Known in this field as the Big Seam or Mary Lee. Carboniferous age, Pottsville group. Average thickness, 5 to 6 feet, with partings; immediate roof, strong shale, and above that, heavy-bedded standstones; floor, shale.

The bed was measured and sampled at two points by J. J. Rutledge on May 18, 1910, as described below:

Sections of coal bed in Palos mine, at Palos.

Section	A		B	
Laboratory No.	10505		10506	
Main roof, massive sandstone.				
Immediate roof, strong shale.	*Ft.*	*in.*	*Ft.*	*in.*
Gray coal	1	3½	1	3
Coal, clean, black	2	6	2	4
Hard, dark shale [a]	0	1	0	1½
Coal	2	1¾	2	3
Floor, clay.				
Thickness of bed	6	¼	5	11½
Thickness of coal sampled	5	11¼	5	10

[a] Not included in sample.

Section A (sample 10505) was taken at the face of room No. 1, cross entry 1, off right entry 4.

Section B (sample 10506) was taken at the face of room No. 5, cross entry 1, off left entry 4.

A composite sample was made by mixing the face samples 10505 and 10506 for ultimate analysis, the results of which are shown under laboratory number 10514.

Notes.—In 1910 the coal at this mine was undercut more or less with pick, and was usually shot down with permissible explosives, but dynamite was used for brushing the roof and in shooting down the "middleman" where that was thick. The coal is hard and makes large lumps. The mine is an old one and it had nearly reached the property boundaries at the time of the investigation. The capacity of the mine in 1910 was 500 to 600 tons per day. The future output was expected to come largely from pillar work.

For chemical analyses of this coal see part I of this bulletin (p. 37).

PINKNEY. TUTWEILER NO. 3 DRIFT.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1793, 1794, 1932, 1933 (pp. 37, 38).

Mine.—Tutweiler No. 3; Birmingham district; a drift mine in sec. 22, T. 16 S., R. 4 W., at Pinkney, on the Southern Railway.

Coal beds.—Nickel Plate and Pratt. Carboniferous age, Pottsville group. Thickness, uniform; dip, flat; roof, shale; floor, clay; cover, 50 to 100 feet.

The Nickel Plate bed was sampled by T. M. Campbell and measured by Charles Butts at two points in June, 1905, as described below:

Section of Nickel Plate coal bed in Tutweiler No. 3 drift at Pinkney.

Laboratory No	1793, 1794	
Roof, shale.	*Ft.*	*in.*
Coal	0	10
Parting	0	½
Coal	0	8¾
Parting	0	1½
Coal	0	3½
Parting	0	½
Coal	0	6
Floor, clay.		
Thickness of bed	2	6¾

Sample 1793 was collected in left heading 2.

Sample 1794 was collected in right heading 4.

The Pratt bed was sampled at two points by T. M. Campbell and measured by Charles Butts in June, 1905, as described below:

Section of Pratt coal bed in Tutweiler No. 3 drift at Pinkney.

Laboratory No	1932, 1933	
Roof, shale.	*Ft.*	*in.*
Coal	0	8½
Parting	0	1
Coal	1	11¼
Parting	0	½
Coal	0	2
Parting	0	½
Coal	1	0
Floor, clay.		
Thickness of bed	3	11¾

Sample 1932 was taken in right heading 9, 900 feet from the main heading.

Sample 1933 was taken in left heading 7, 600 feet from the main entry. It included a 33-inch cut.

For chemical analyses of this coal see part I of this bulletin (pp. 37, 38); also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

REPUBLIC. WARNER MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1755, 1756 (p. 38).

Mine.—Warner; a drift mine in sec. 31, T. 16 S., R. 3 W. in the Birmingham district at Republic, on the Southern Railway.

Coal bed.—Pratt. Carboniferous age, Pottsville group. Thickness, uniform; dip, flat; roof, gray shale; floor, generally shale; cover, 50 to 200 feet.

The bed was measured and sampled at two points by Charles Butts on June 24, 1905, as described below:

Section of coal bed in Warner mine at Republic.

Section	A		B	
Laboratory No.	1755		1756	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	6½	0	4
Bone [a]	0	2½	0	3
Coal	2	3½	2	4
Rash [a]	0	1½	0	1½
Coal	0	9	0	11
Floor, slate and clay.				
Thickness of bed	3	11	3	11½
Thickness of coal sampled	3	7	3	7

[a] Not included in sample.

Section A (sample 1755) was measured in room 23, off right heading 12, about 8,000 feet from the slope mouth.

Section B (sample 1756) was measured in room 19, off left heading 12, about 8,000 feet from slope mouth.

Notes.—As at other points in this mine, there is 5 inches clay underlain with 10 inches of coal below the bed as shown in the above sections. The coal is firm and bright with well-developed cleat. In 1905 when the samples were collected, the coal was used almost wholly for coke making, at the mine. The Pratt bed throughout the Warrior field is the standard coking coal of the Birmingham district.

For chemical analyses of this coal see part I of this bulletin, p. 38; also U. S. Geol Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

WARRIOR. WATT MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 3944, 3949 (p. 38).

Mine.—Watt; a drift mine in sec. 26, T. 14 S., R. 3 W., 1 mile southwest of Warrior, on the Louisville & Nashville Railroad.

Coal bed.—Black Creek and Jefferson beds. The coal is of Carboniferous age, Pottsville group. The coal in the Black Creek bed is uniform in thickness, measuring about 3 feet 3½ inches, with a shale roof and floor. Cover, 200 feet. The coal in the Jefferson bed is variable in thickness, measuring, at point sampled, 2 feet 7 inches, with several partings.

The beds were measured and sampled by W. F. Prouty on October 6, 1906, as described below:

Section of Jefferson coal bed in Watt mine at Warrior.

Laboratory No.	3944	
Roof, shale.	*Ft.*	*in.*
Coal	0	11
Bone [a]	0	1
Coal	1	0
Clay [a]	0	3
Coal	0	4
Floor, shale.		
Thickness of bed	2	7
Thickness of coal sampled	2	3

[a] Not included in sample.

Section of Black Creek coal bed in Watt mine at Warrior.

Laboratory No	3949
Roof, shale.	*Ft. in.*
Coal (hard)	1 2
Coal (not so hard)	2 1½
Floor, shale.	
Thickness of bed	3 3½
Thickness of coal sampled	3 3½

Notes.—Coal hard to firm; well-developed cleat; nearly all used for steam and domestic purposes. Mine not operating in 1909.

For chemical analyses of this coal see part I of this bulletin, p. 38.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212; Bull. 400, p. 170.

WYLAM. PRATT NO. 4 MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 2430, 2433 (p. 38).

Mine.—Pratt No. 4; a slope mine in sec. 36, T. 17 S., R. 4 W., at Wylam, in the Birmingham district, on the Birmingham Southern Railroad.

Coal bed.—Pratt. Carboniferous age, Pottsville group. Thickness, uniform; dip at entry, 40° W., nearly flat in body of mine; roof, sandstone; floor, shale; cover, 200 to 400 feet.

The bed was measured and sampled by Charles Butts in October, 1905, as described below:

Section of coal bed in Pratt No. 4 mine at Wylam.

Laboratory No	2433
Roof, sandstone.	*Ft. in.*
Coal	0 8½
Shale [a]	0 1¾
Coal	3 8
Floor, shale.	
Thickness of bed	4 6¼
Thickness of coal sampled	4 4½

[a] Not included in sample.

The above section was measured on the face of the main slope.

Sample 2430 was taken in room 1, off cross heading 6.

Sample 2433 was taken in room 5, off the Kelso entry.

Notes.—The coal is firm and bright with distinct cleat. Mainly used for coke.

For chemical analyses of this coal see part I of this bulletin, p. 38; also U. S. Geol. Survey Bull. 285, p. 221.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 212.

ST. CLAIR COUNTY.

DAVIS (TILLMAN STATION). MARGARET NO. 1 MINE.

Sample.—Bituminous coal, Cahaba field; analysis No. 3484 (p. 38).

Mine.—Margaret No. 1; a slope mine at Davis (Tillman station), on the Central of Georgia Railway.

Coal bed.—Harkness. Carboniferous age, Pottsville group. Thickness, uniform; dip, about 15° E.; roof, shale; floor, clay.

The bed was measured and sampled at one point by Charles Butts on July 19, 1906, as described below:

Section of coal bed in Margaret No. 1 mine at Davis (Tillman station).

Laboratory No.	3484	
	Ft.	*in.*
Roof, clay overlain with shale.		
Coal	0	7½
Clay [a]	0	4½
Coal	0	7¼
Clay [a]	0	9
Coal	2	6
Floor, clay.		
Thickness of bed	4	10¼
Thickness of coal sampled	3	8¾

[a] Not included in sample.

Section (sample 3484) was measured in the main entry 800 feet from the slope mouth.

Notes.—Coal firm, bright, medium hardness, no cleat. Used for domestic and steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 38.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

SHELBY COUNTY.

ALDRICH. ALDRICH MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 9339, 9340 (pp. 38, 39).

Mine.—Aldrich, a slope mine at Aldrich, on the Southern Railway.

Coal bed.—Montevallo. Carboniferous age, Pottsville group. Thickness, uniform; dip, 10° NW.; roof, shale overlain with conglomerate; floor, fire clay; cover, 200 feet.

The bed was measured and sampled at two points by Charles Butts on November 22, 1909, as described below:

Section of coal bed in Aldrich mine at Aldrich.

Section	A		B	
Laboratory No.	9339		9340	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal, bony	[a] 0	10	[a] 0	4
Coal (clear, hard)	2	0	2	2
Parting (clay and coal)	[a] 1	3	[a] 0	11
Coal	0	7	[a] 0	8
Sandstone	[a] 2	0	..	..
Coal (reported)	[a] 1	0	..	..
Floor, clay.				
Thickness of bed	5	10	4	1
Thickness of coal sampled	2	7	2	10

[a] Not included in sample.

Section A (sample 9339) was measured in west heading 9, just off the main slope, about 200 feet from slope mouth.

Section B (sample 9340) was measured in room 37, off west heading 6, about 1,000 feet in mine.

Notes.—Coal strong and resistant to weathering. Fragments, said to have been on the ground for 50 years, have not lost their sharp angles. Used mainly for domestic purposes. Shipped to points throughout the Gulf states.

For chemical analyses of this coal see part I of this bulletin, pp. 38, 39; also U. S. Geol. Survey Bull. 431, p. 145.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 91.

COALMONT. COALMONT MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3745 (p. 39).

Mine.—Coalmont; a slope mine at Coalmont, on the Louisville & Nashville Railroad.

Coal bed.—Thompson. Carboniferous age, Pottsville group. Thickness, variable; dip, about 25° S.; roof and floor, sandstone; cover, 300 feet.

The bed was measured and sampled by W. F. Prouty on August 29, 1906, as described below:

Section of coal bed in Coalmont mine at Coalmont.

Laboratory No	3745
Roof, sandstone.	*Ft. in.*
Coal	2 0
Shale[a]	0 2
Coal	2 10
Floor, sandstone.	
Thickness of bed	5 0
Thickness of coal sampled	4 10

[a] Not included in sample.

Notes.—Coal used for making steam. Production in 1909, 70,709 tons. Output in 1910, 63,568 tons.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

FALLISTON. FALLISTON MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3744 (p. 39).

Mine.—Falliston; a slope mine ½ mile east of Falliston, on the Louisville & Nashville Railroad.

Coal bed.—Buck. Carboniferous age, Pottsville group. Thickness, somewhat variable; dip, about 35° E.; roof, shale; floor, shale; cover, 40 to 200 feet.

The bed was measured and sampled by W. F. Prouty on August 28, 1906. The sample represented 2 feet 5 inches of coal. It was measured near the mine mouth.

Notes.—Small mine. Coal firm; used for making steam.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

GLEN CARBON. GLEN CARBON MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 9667, 10502, 10503, 10504, 10515 (p. 39).

Mine.—Glen Carbon; at Glen Carbon.

Coal bed.—Black Shale (Gholson). The coal is of Carboniferous age, Pottsville group. Thickness, about 3 feet 1 inch, free from partings.

The bed was measured and sampled by J. J. Rutledge in 1910.

Sample 10503 was taken in face of C heading, 37-inch bed, 37-inch cut.

Sample 10502 was taken in face of west heading 6, 36-inch bed, 36-inch cut.

Sample 10504 was taken in face of east heading 11, 35-inch bed, 25-inch cut.

A composite sample was made by mixing the face samples 10502, 10503, and 10504 for an ultimate analysis, the results of which are shown under laboratory number 10515 (p. 39).

The bed was also measured and sampled on December 31, 1909, by Charles Butts. The sample (No. 9667) represented a 3¾-foot cut of coal. It was taken in room 15, off east heading 12, 3,000 feet in mine.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 431, p. 144.

HELENA. PROSPECT SLOPE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3769 (p. 39).

Mine.—Prospect; a slope near Acton No. 2 mine in Acton Basin, 4½ miles northeast of Helena, ¾ mile northwest of Acton.

Coal bed.—Thompson. Carboniferous age, Pottsville group. Thickness, variable, dip, about 30° E.; roof, conglomerate; floor, clay.

The bed was measured and sampled by C. W. Washburne, on September 14, 1906, as described below:

Section of coal bed near Acton No. 2 mine, 4½ miles northeast of Helena.

Laboratory No.	3769	
Roof, shale overlain with conglomerate.	*Ft.*	*in.*
Coal [a]	0	4
Clay [a]	0	2
Coal [a]	0	2
Clay [a]	0	2
Coal [a]	0	2
Clay [a]	0	1
Coal [a]	0	2
Clay [a]	0	5
Clay (sandy) [a]	0	5
Clay [a]	1	0
Coal	1	3
Floor, clay.		
Thickness of bed	4	4
Thickness of coal sampled	1	3

[a] Not included in sample.

Section (sample 3769) was measured in the slope (lower bench) not far from mouth.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

HELENA. ACTON NO. 2 MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3771 (p. 39).

Mine.—Acton No. 2; a slope mine 5 miles northeast of Helena, on the Louisville & Nashville Railroad.

Coal bed.—Helena. Carboniferous age, Pottsville group. Thickness, variable; dip, about 15° E.; roof, sandy shale; floor, sandstone; cover, 50 to 300 feet.

The bed was measured and sampled by C. W. Washburne on September 11, 1906, as described below:

Section of coal in Acton No. 2 mine, 5 miles northeast of Helena.

Laboratory No.	3771	
Roof, shale and clay.	*Ft.*	*in.*
Coal	4	2
Rash [a]	0	1
Clay [a]	0	6
Coal [a]	0	1
Clay [a]	0	¾
Coal [a]	0	1½
Clay [a]	0	½
Coal	1	2
Clay [a]	0	½
Coal	0	4
Clay [a]	0	½
Floor, sandstone.		
Total thickness of bed	6	7¾
Thickness of coal sampled	5	8

[a] Not included in sample.

Section (sample 3771) was measured at bottom of the air shaft.

Notes.—Mine just opened when sampled. Coal firm, used for domestic and steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78. Bull. 431, p. 136.

MAYLENE. CLIMAX MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 9610 (p. 39).

Mine.—Climax; in sec. 20, T. 21 S., R. 3 W., 1¼ miles southwest of Maylene.

Coal bed.—Maylene. Carboniferous age, Pottsville group.

The bed was measured and sampled on December 11, 1909, by Charles Butts, as shown below:

Section of coal bed in Climax mine, 1¼ miles southwest of Maylene.

Laboratory No.	9610	
	Ft.	*in.*
Bone [a]	0	6
Coal	2	5
Shale [a]	0	6
Coal [a]	0	6
Thickness of bed	3	11
Thickness of coal sampled	2	5

[a] Not included in sample.

The sample was taken in the face of west heading 14, 2,000 feet in mine.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 431, p. 145.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 142.

STRAVEN. STRAVEN MINE.

Sample.—Bituminous coal; Cahaba field; analyses Nos. 9311, 9612 (p. 39).

Mine.—Straven; in sec. 7 T. 21 S., R. 3 W., at Straven.

Coal bed.—Montevallo (?). Carboniferous age, Pottsville group.

The bed was measured and sampled at two points on December 10, 1909, by Charles Butts.

Sample 9611 represented a 2-foot cut of coal. It was taken in room 5, off west heading 5, 900 feet in mine.

Sample 9612, representing 1 foot 11 inches of coal, was taken in room 15, off east heading 5, 900 feet in mine.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 431, p. 145.

SYDENTON. STAR-CAHABA NO. 1 (ELVIRA) MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3646 (p. 39).

Mine.—Star-Cahaba No. 1 (Elvira), Birmingham district; a slope mine 1 mile west of Sydenton, on the Louisville & Nashville Railroad.

Coal bed.—Gould. Carboniferous age, Pottsville group. Thickness, variable; dip, 20° E.; roof, thin layer of shale overlain with sandstone; floor, fire clay underlain with shale; cover, 50 to 250 feet.

The bed was measured and sampled by C. W. Washburne on August 25, 1906, as described below:

Section of coal bed in Star-Cahaba No. 1 (Elvira) mine, 1 mile west of Sydenton.

Laboratory No.	3646	
Roof, shale:	*Ft.*	*in.*
Coal	4	0
Rash [a]	0	8
Floor, clay:		
Thickness of bed	4	8
Thickness of coal sampled	4	0

[a] Not included in sample.

Section (sample 3646) was measured 200 feet from the slope mouth.

Notes.—Coal firm. Used for steam.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

TACOA. STAR-CAHABA NO. 2 MINE.

Sample.—Bituminous coal; Cahaba field; analysis No. 3770 (p. 39).

Mine.—Star-Cahaba No. 2, a slope mine 1 mile west of Tacoa, on the Louisville & Nashville Railroad.

Coal bed.—Wadsworth. Carboniferous age, Pottsville group. Thickness, uniform; dip, 20° to 40° NW.; roof, shale overlain with sandstone; floor, fire clay; cover, 100 to 200 feet.

The bed was measured and sampled by C. W. Washburne on August 28, 1906.

The sample included 3 feet of coal, and was measured at entrance to mine. The coal sampled was weathered.

Notes.—Production in 1907, 3,364 tons.

For chemical analyses of this coal see part I of this bulletin, p. 39; also U. S. Geol. Survey Bull. 316, p. 114.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 78.

TUSCALOOSA COUNTY.

ABERNANT. ABERNANT MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 2538 and 2540 (p. 39).

Mine.—Abernant; a slope mine in sec. 18, T. 20 S., R. 6 W., at Abernant, on the Lousiville & Nashville Railroad.

Coal bed.—Jagger. Carboniferous age, Pottsville group. Thickness uniform; dip, 20° W.

Notes.—The coal bed at this mine was sampled at two points by E. F. Burchard on December 13, 1905. No further data recorded. The coal is strong and bright. A coking as well as domestic and steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 39.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361, Bull. 400, p. 170.

BROOKWOOD. BROOKWOOD NO. 10 MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1187 (p. 40).

Mine.—Brookwood No. 10; a drift mine at Brookwood.

Coal bed.—Carter. Carboniferous age, Pottsville group. Thickness, variable, flat; roof, thin shale, overlain with sandstone; floor, shale; cover, 50 to 200 feet.

The bed was measured and sampled by Charles Butts on October 1, 1904, as described below:

Section of coal bed in Brookwood No. 10 mine at Brookwood.

Laboratory No.	1187	
Roof, thin shale overlain with sandstone.	*Ft.*	*in.*
Coal	1	10
Shale [a]	0	1
Coal	1	0
Floor, shale.		
Thickness of bed	2	11
Thickness of coal sampled	2	10

[a] Not included in sample.

Section (sample 1187) was measured at the end of the main entry about 250 feet from drift mouth.

Notes.—A new mine at time of visit. Coal strong and bright; used for making coke.

For chemical analyses of this coal see part I of this bulletin, p. 40; also U. S. Geol. Survey Prof. Paper 48, p. 40; Bull. 260, p. 380.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

BROOKWOOD. BROOKWOOD NO. 12 MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1185 (p. 40).

Mine.—Brookwood No. 12; a drift mine at Brookwood.

Coal bed.—Brookwood. Carboniferous age, Pottsville group. Thickness, uniform; flat; roof, shale; floor, shale; cover, 50 to 200 feet.

The bed was measured and sampled by Charles Butts on October 1, 1904, as described below:

Section of coal bed in Brookwood No. 12 mine at Brookwood.

Laboratory No	1185	
Roof, shale.	*Ft.*	*in.*
Coal (not mined) [a]	0	2
Clay [a]	0	4½
Coal	1	8
Shale [a]	0	1
Coal	0	7½
Shale [a]	0	2
Coal	0	11
Floor, shale.		
Thickness of bed	4	0
Thickness of coal sampled	3	2½

[a] Not included in sample.

Section (sample 1185) was measured in right heading 1.

Notes.—A new mine at time of visit. Coal strong and bright; used for making coke after being washed.

For chemical analyses of this coal see part I of this bulletin, p. 40.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 368; Bull. 400, p. 170.

BROOKWOOD. BROOKWOOD NO. 7 MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1186 (p. 40).

Mine.—Brookwood No. 7; at Brookwood, on the Louisville & Nashville Railroad.

Coal bed.—Milldale. Carboniferous age, Pottsville group.

The bed was measured and sampled on October 1, 1904, by Charles Butts, as shown below:

Section of coal bed in Brookwood No. 7 mine at Brookwood.

Laboratory No	1186	
	Ft.	*in.*
Coal	0	4½
Parting [a]	0	½
Coal	1	10
Thickness of bed	2	3
Thickness of coal sampled	2	2½

[a] Not included in sample.

The sample was taken in west entry 12.

For chemical analyses of this coal see part I of this bulletin, p. 40.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 369.

KELLERMAN. CENTRAL DRIFT.

Sample.—Bituminous coal; Warrior field; analysis No. 1164 (p. 40).

Mine.—Central drift mine at Kellerman, on the Mobile & Ohio Railroad.

Coal bed.—Brookwood. Carboniferous age, Pottsville group. Thickness, uniform; flat; roof, shale; floor, shale; cover, 50 to 150 feet.

The bed was measured and sampled by Charles Butts on September 30, 1904, as described below:

Section of coal bed in central drift at Kellerman.

Laboratory No	1164	
Roof, shale.	*Ft.*	*in.*
Coal	2	0
Bone [a]	0	3
Coal	0	8
Bone [a]	0	1
Coal	0	8
Bone [a]	0	1½
Coal	0	11½
Shale [a]	0	½
Coal	0	6
Shale [a]	0	9
Coal	1	2
Floor, shale.		
Thickness of coal bed	7	2½
Thickness of coal sampled	5	11½

[a] Not included in sample.

Section (sample 1164) was measured in cross entry 16, 500 feet from main entry.

Notes.—Coal strong and bright, a good coking coal. Stratigraphically the highest minable bed in Warrior field. Output used for making coke.

For chemical analyses of this coal see part I of this bulletin, p. 40; also U. S. Geol. Survey Prof. Paper 48, p. 40; Bull. 260, p. 380.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

ROCK CASTLE. ROCK CASTLE MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 2539 (p. 40).

Mine.—Rock Castle; a slope mine at Rock Castle (sec. 25, T. 20 S., R. 7 W.), on the Louisville & Nashville Railroad.

Coal bed.—Jagger. Carboniferous age, Pottsville group. Thickness, uniform dip, 20° NW.; roof, shale, overlain with sandstone; floor, shale; cover, 100 to 500 feet.

The bed was measured and sampled by Charles Butts on December 13, 1905, as described below:

Section of coal bed in Rock Castle mine at Rock Castle.

Laboratory No	2539	
Roof, shale.	*Ft.*	*in.*
Coal	1	7
Clay [a]	0	6½
Coal	0	11
Rash [a]	0	3
Coal	2	4
Clay [a]	0	4½
Coal	1	0
Floor, shale.		
Thickness of bed	7	0
Thickness of coal sampled	5	10

[a] Not included in sample.

Section (sample 2539) was measured near the main slope about 500 feet from the slope mouth.

Notes.—Coal strong and bright; used for steam and domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 40.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

SEARLES. SEARLES MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1210 (p. 40).

Mine.—Searles; a drift mine at Searles, on the Louisville & Nashville Railroad.

Coal bed.—Brookwood. Carboniferous age, Pottsville group. Thickness, uniform; flat; roof, shale; floor, thin layer of shale overlain with sandstone; cover, 50 to 200 feet.

The bed was measured and sampled by E. F. Burchard on October 5, 1904, as described below:

Section of coal bed in Searles mine at Searles.

Laboratory No	1210	
Roof, shale.	*Ft.*	*in.*
Coal	1	0
Bone [a]	0	5
Coal	0	8
Bone [a]	0	1½
Coal	0	8
Bone [a]	0	1½
Coal	1	0
Shale [a]	1	3
Coal	2	0
Floor, sandstone.		
Thickness of bed	7	3
Thickness of coal sampled	5	4

[a] Not included in sample.

Section (sample 1210) was measured in room 3, off left heading 7.

Notes.—Coal strong and bright; used for coke.

For chemical analyses of this coal see part I of this bulletin, p. 40; also U. S. Geol. Survey Prof. Paper 48, p. 40; Bull. 260, p. 380.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

TIDEWATER. TIDEWATER MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 1593 (p. 40).

Mine.—Tidewater; a drift mine at Tidewater, on the Mobile & Ohio Railroad.

Coal bed.—Brookwood. Carboniferous age, Pottsville group. Thickness, uniform; flat; roof, shale; floor, shale; cover, 300 feet.

The bed was measured and sampled by Charles Butts, on October 10, 1904, as described below:

Section of coal bed in Tidewater mine at Tidewater.

Laboratory No	1593	
Roof, shale.	*Ft.*	*in.*
Coal	0	11
Shale [a]	0	1
Coal	0	3
Clay [a]	0	5
Coal	0	10½
Clay [a]	0	2½
Coal	1	1
Floor, shale.		
Thickness of bed	3	10
Thickness of coal sampled	3	1½

[a] Not included in sample.

Section (sample 1593) was measured in main entry about 600 feet from drift mouth.

Notes.—Coal hard. Mostly used for steam purposes.

For chemical analyses of this coal see part I of this bulletin, p. 40; also U. S. Geol. Survey Prof. Paper 48, p. 40; Bull. 260, p. 380.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

YOLANDE. YOLANDE NO. 1 MINE.

Sample.—Bituminous coal; Warrior field; analysis No. 2543 (p. 40).

Mine.—Yolande No. 1; a slope mine (sec. 17, T. 20 S., R. 6 W.), at Yolande, on the Louisville & Nashville Railroad.

Coal bed.—Jagger. Carboniferous age, Pottsville group. Thickness, uniform; dip, 20° NW.; roof, shale; floor, sandstone; cover, 100 to 1,000 feet.

The bed was measured and sampled by Hoyt S. Gale, on December 13, 1905, as described below:

Section of coal bed in Yolande No. 1 mine at Yolande.

Laboratory No.	2543	
	Ft.	*in.*
Roof, shale.		
Coal	0	2
Shale [a]	0	7
Rash (bone) [a]	0	6
Coal	1	8
Fireclay [a]	0	5
Coal	3	3
Fireclay [a]	0	4
Coal	1	2
Floor, shale.		
Thickness of coal bed	8	1
Thickness of coal sampled	6	3

[a] Not included in sample.

Section (sample 2543) was measured in the main entry, 250 feet from slope mouth.

Notes.—Coal used for making coke and for steam production.

For chemical analyses of this coal see part I of this bulletin, p. 40.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 260, p. 361; Bull. 400, p. 170.

WALKER COUNTY.

CARBON HILL. CHICKASAW NO. 5 MINE.

Sample.—Bituminous coal; Warrior field; (Alabama Nos. 2A and 2B) analyses Nos. 1075, 1076, 3011, 3012 (pp. 40, 41).

Mine.—Chickasaw No. 5; Walker County district; three-fourths mile northwest of Carbon Hill, on the St. Louis & San Francisco Railroad.

Coal bed.—Jagger. Carboniferous age, Pottsville group. Bed lies nearly horizontal and seems to occur in swamps, or local developments of thick coal. Mine worked by a slope at a depth of about 30 feet. Bed contains partings of shale and bone. Roof is hard gray shale; floor is hard clay.

Two mine samples, Nos. 1075 and 1076, were taken by M. R. Campbell in 1904. Two other samples, Nos. 3011 and 3012, were taken by J. S. Burrows and J. W. Groves on March 9, 1906. The measured sections from which the samples were collected were as follows:

Sections of coal bed in Chickasaw No. 5 mine, ¾ mile northwest of Carbon Hill.

Section	A		B		C		D	
Laboratory No.	1075		1076		3011		3012	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.								
Coal	0	7	0	8	0	7	0	7
Shale [a]	0	7	0	7½	0	8	0	7½
Coal	1	0	0	8	3	2	0	7
Dirty coal [a]	0	1	..	..	..	..	..	..
Bony coal [a]	..	..	0	1	..	..	..	..
Mother coal	..	..	..	..	..	..	0	⅛
Coal	2	2½	2	5	..	..	0	7
Mother coal	..	..	..	..	..	..	0	¼
Coal	..	..	..	..	..	..	2	1
Floor, shale.								
Thickness of bed	4	5½	4	5½	4	5	4	5⅞
Thickness of coal sampled	3	9½	3	9	3	9	3	10⅜

[a] Not included in sample.

Section A (sample 1075) was measured in west entry 3, off the north main entry, about 2,000 feet from the foot of the slope.

Section B (sample 1076) was measured in east entry 4, at about 1,200 feet from the foot of the slope.

Section C (sample 3011) was measured in left entry 3, off the main north entry, 3,500 feet northeast of the slope.

Section D (sample 3012) was measured in north entry 1, off the old west entry, 3,500 feet north of the foot of the slope.

Notes.—In 1904 the "fancy lump" formed 15 per cent of the output, lump 30 per cent, nut 47 per cent, and slack 8 per cent. About 80 per cent of the total was used by locomotives, and about 15 per cent by factories in the Birmingham district. Much of the fancy lump was sold for domestic use.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 337; Bull. 261, p. 80; Bull. 332, p. 14; Bureau of Mines Bull. 23, pp. 58, 145; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1017; Bull. 261, p. 88; Bureau of Mines Bull. 13, pp. 103, 272; briquetting tests: U. S. Geol. Survey Bull. 332, p. 49; washing tests: U. S. Geol. Survey Bull. 336, p. 13; Bull. 332, p. 48; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1328; Bull. 261, p. 122; Bull. 336, pp. 21, 27, 36; Bull. 332, p. 48; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74; Bull. 332, pp. 48, 49.

For chemical analyses see Part I of this bulletin, pp. 40–41; also U. S. Geol. Survey Prof. Paper 48, p. 197; Bull. 261, p. 32; Bull. 332, p. 47.

HORSE CREEK. NO. 8 MINE.

Sample.—Bituminous coal; Warrior field; analyses Nos. 1077 and 1078 (Alabama No. 1) (p. 41).

Mine.—No. 8, in the Walker County district; a slope mine; 1½ miles west of Horse Creek, on the St. Louis & San Francisco Railroad.

Coal bed.—Mary Lee of the Alabama Geological Survey; locally known as the Horse Creek. Carboniferous age; Pottsville group. Thickness, rather uniform; roof, strong, sandy shale, which stands well; floor, fire clay.

The bed was measured and sampled at two points by M. R. Campbell in 1904, as noted below:

Sections of coal bed in No. 8 mine at Horse Creek.

Section	A		B	
Laboratory No.	1078		1077	
Roof, sandy shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	8	2	10
Bone [a]	0	1	0	½
Coal	0	4¾	0	5
Slate [a]	0	1¼	..	..
Bone [a]	..	..	0	¼
Coal	0	2	0	2½
Slate [a]	0	5	0	5½
Coal	1	10	1	5
Bone [a]	0	1¼	0	1
Coal	1	0	2	4½
Bony coal [a]	0	1	..	..
Coal	1	2	..	..
Floor, fire clay.				
Thickness of bed	8	¼	7	10¼
Thickness of coal sampled	7	2¾	7	3

[a] Not included in sample.

Section A (sample 1077) was measured in left entry 1, off right entry 3, about 1,450 feet from mine mouth.

Section B (sample 1078) was measured in room 24, off left entry 2, 1,250 feet from mine mouth.

Notes.—In 1904 the coal from this mine was used mostly for steam production in the Birmingham district. The slack coal from an adjoining mine on the same bed was washed and coked.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 321; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 58; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1429; Bull. 261, p. 148; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1466; Bull. 261, p. 66; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1326; Bull. 261, p. 121; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1371; Bull. 261, p. 129.

For chemical analyses see Part I of this bulletin, p. 41; also U. S. Geol. Survey Prof. Paper 48, p. 196; Bull. 261, p. 32.

ALASKA.

ALASKA PENINSULA.

CHIGNIK BAY. ALASKA PACKERS' ASSOCIATION MINE.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6953 (p. 41).

Location.—On north side Chignik River, 2 miles below Chignik Lake.

Coal bed.—The coal is of Upper Cretaceous age, Chignik formation.

The bed was measured and sampled in 1908 by W. W. Atwood. The cut was taken across a clean face.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 467, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 467, p. 97.

CHIGNIK BAY. HOOK BAY MINE.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6952 (p. 41).

Mine.—Hook Bay; on west side of main stream, 7 miles northwest of Hook Bay, on east side of Chignik Bay.

Coal bed.—The coal is of Upper Cretaceous age, Chignik formation.

The bed was measured and sampled by W. W. Atwood in 1908, as shown below:

Section of coal bed in Hook Bay mine, on east side of Chignik Bay.

	Ft.	*in.*
Roof, firm sandstone.		
Coal	1	3
Clay	0	8
Coal	0	4
Clay	0	7
Coal	1	6½
Clay parting	0	2
Bony coal	0	5
Coal	1	5½
Bone	0	1
Floor, shale.		
Thickness of bed	6	6

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 467, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 467, p. 99.

CHIGNIK BAY. OUTCROP.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6956 (p. 41).

Location.—Outcrop; in Thompson Valley, ¾ mile above mouth of stream.

Coal bed.—Not named. The coal is of Upper Cretaceous age, Chignik formation.

The bed was measured and sampled by W. W. Atwood in 1908, as shown on the following page.

Sections of coal beds in outcrop, Thompson Valley, on Chignik Bay.

LOWER BED.

	Ft.	in.
Roof, sandy shale.		
Coal	1	8
Shale parting	0	2
Coal	2	6
Coaly shale	0	4
Coal	0	5
Bone	0	1
Coal	0	2
Floor, sandstone.		
Thickness of bed	5	4

UPPER BED.

	Ft.	in.
Roof, cross-bedded sandstone.		
Clay	0	2
Coal	0	4
Coaly shale	0	4
Shale	0	8
Coaly shale	0	4
Coal	1	0
Clay parting	0	1
Coal	2	6
Coaly shale	0	8
Coal	4	0
Bone	0	8
Coal	0	5
Shale	0	5
Bony coal	0	8
Thickness of bed	12	3

The sample was taken from the upper bed.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 467, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 467, p. 109.

Chignik Bay. Whalers Creek Mine.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6955 (p. 41).

Mine.—Whalers Creek; ¾ mile above mouth of Whalers Creek, at Chignik Lagoon.

Coal bed.—Whalers Creek. The coal is of Upper Cretaceous age, Chignik formation.

The bed was measured and sampled by W. W. Atwood in 1908.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 467, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 407, p. 110.

Coal Harbor. Outcrop.

Sample.—Lignite; Alaska Peninsula field; analysis No. 6954 (p. 41).

Location.—Outcrop; on cliff ½ mile north of coal mine; at Coal Harbor, Unga Island.

Coal bed.—Coal Harbor. The coal is of Eocene age, Kenai formation.

The bed was measured and sampled by W. W. Atwood in 1908.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 467, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 467, p. 118.

Herendeen Bay. Johnson Tunnel.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6951 (p. 41).

Mine.—Johnson tunnel; 1¼ miles above mouth of Mine Creek, and about 870 feet above sea level.

Coal bed.—Not named. The coal is of Upper Cretaceous age, Chignik formation.

The sample was cut across face of clean bed.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol Survey Bull. 467, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 467, pp. 96–103.

HERENDEEN BAY. LOWER TUNNEL NO. 1.

Sample.—Bituminous coal; Alaska Peninsula field; analysis No. 6957 (p. 41).

Mine.—Lower tunnel No. 1; ¾ mile above mouth of Mine Creek, on Herendeen Bay.

Coal bed.—The coal is of Upper Cretaceous age, Chignik formation. Roof, shale; floor, firm sandstone.

The bed was measured and sampled by W. W. Atwood in 1908, as described below:

Section of coal bed in lower tunnel No. 1, ¾ mile above mouth of Mine Creek.

Laboratory No	6957	
Roof, shale.	*Ft.*	*in.*
Coal, shaly	1	1
Bone	0	2
Coal	1	1
Coal	0	2
Coal	1	4
Floor, firm sandstone.		
Thickness of bed	3	10
Thickness of coal sampled	3	10

For chemical analyses of this coal see part I of this bulletin, p. 41.

For geologic relations see U. S. Geol. Survey Bull 467, p. 99.

BERING RIVER.

BERING LAKE SHORE. TUNNEL NEAR DICK CREEK.

Sample.—Semibituminous coal; Bering River field; analysis No. 4427 (p. 41).

Location.—Tunnel on shore of Bering Lake, half way between Poul Point and mouth of Dick Creek.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 6 feet 6 inches; roof, shale; floor, soft shale, 6 inches thick with possibly some coal beneath; dip, 72° NW.

The bed was measured and sampled by G. C. Martin in 1906, as shown below:

Section of bed in tunnel on Bering Lake, halfway between Poul Point and mouth of Dick Creek.

Laboratory No	4427	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	8
Sandstone [a]	1	0
Coaly shale [a]	0	10
Coal	4	0
Floor, soft shale.		
Thickness of bed	6	6
Thickness of coal sampled	4	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 41; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 81.

CANYON CREEK. PROSPECT.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 4433, 4461 (p. 42).

Location.—Prospect on tributary to Canyon Creek, on east side and next below Hunt's cabin.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 6 feet 9 inches, with no partings; dip, 31° NE.; roof (sample 4433), firm shale; floor, shale. Thickness of what was probably the same bed near by, 2 feet 7 inches.

The bed was sampled and measured at two points by G. C. Martin in 1906.

Sample 4433 included 2 feet 7 inches of coal.

Sample 4461 included 6 feet 9 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 69.

CARBON CREEK. TUNNEL ON SOUTH BANK.

Sample.—Semibituminous coal; Bering River field; analysis No. 2492 (p. 42).

Mine.—Tunnel on south bank of Carbon Creek.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 8 to 11 feet; roof, arkose; floor, shale. Bed contains no partings.

The bed was measured and sampled by G. C. Martin in 1905. The section (sample 2492) represented 8 to 11 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 77.

CARBON MOUNTAIN. OPENINGS IN OUTCROP NEAR HILLSIDE TRAIL.

Sample.—Anthracite coal; Bering River field; analyses Nos. 2480, 2483 (p. 42).

Location.—Outcrop, on east side of Carbon Mountain.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 10½ to 15+ feet.

The bed was measured at three and sampled at two points in the mine by G. C. Martin.

Section A, measured in the third opening from the west end on the hillside trail, showed 10 feet 6 inches of coal.

Section B (sample 2483), measured in the first opening, included 10 feet 6 inches of coal which was overlain and underlain with shale.

Section C (sample 2480), measured in the second opening, included 15+ feet of coal, which was underlain and overlain with shale.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 68.

CARBON MOUNTAIN. OUTCROP, BELOW HILLSIDE TRAIL ON EAST SIDE.

Sample.—Anthracite coal; Bering River field; analysis No. 2487 (p. 42).

Location.—Outcrop, section of bed 200 feet below hillside trail on east side of Carbon Mountain.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 4 feet 8 inches; floor and roof, shale dip, 30° NE. Bed contains no partings.

The bed was measured and sampled by G. C. Martin in 1905. The sample included 4¾ feet of clean coal.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 335, pp. 31–35, 68.

CARBON MOUNTAIN. PROSPECT ON WEST SLOPE OPPOSITE MOUTH OF CANYON CREEK.

Sample.—Semianthracite coal; Bering River field; analyses Nos. 4459, 4462 (p. 42).

Location.—Prospect, on creek on west slope of Carbon Mountain opposite mouth of Canyon Creek; elevation of sample 4459, 900 feet; sample 4462, 950 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Roof and floor, shale; thickness, variable, averaging about 4 feet 8 inches, with two partings; dip, 53° NW., but variable.

The bed was measured and sampled by G. C. Martin in 1906 as shown below:

Section of coal bed in creek on west slope of Carbon Mountain opposite mouth of Canyon Creek.

Laboratory No	4462		4459	
Roof: Sample 4462, shale; sample 4459, arkose.	*Ft.*	*in.*	*Ft.*	*in.*
Coal[a]	1	0	..	..
Coal (from 8 to 22 inches)	..	..	1	8
Shale[a]	1	0	..	..
Coal (from 3 to 21 inches)	1	5	..	..
Shale (from 1 to 18 inches)[a]	0	1	..	..
Coal (from 14 to 24 inches)	1	2	..	..
Floor, hard shale.				
Thickness of bed	4	8	1	8
Thickness of coal sampled	2	7	1	8

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 70.

CARBON MOUNTAIN. OPENING NEAR CREST BETWEEN TRAILS.

Sample.—Semianthracite coal; Bering River field; analyses Nos. 2481, 2479 (p. 42).

Location.—Outcrop, section in opening near crest (west side) of Carbon Mountain between Hunt's and Green's trails. This coal has the physical characteristics of the anthracite at the other openings in the vicinity but whose analyses indicate semianthracite. From structural relations it seems probable that one of the beds corresponds to the lower bed in the eastern side of the mountain, described elsewhere.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 4 feet (average) containing a parting; floor and roof, shale; dip 38° NW.

The bed was measured and sampled at two points by G. C. Martin in 1905, as shown below:

Section of coal bed in opening near crest (west side) of Carbon Mountain.

Section	A.		B.	
Laboratory No	2481		2479	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, impure[a]	..	..	0	3
Coal	5	3	2	10
Floor, shale.				
Thickness of bed	5	3	3	1
Thickness of coal sampled	5	3	2	10

[a] Not included in sample.

Section A (sample 2481) was measured in opening near crest (west side) of Carbon Mountain between Hunt's and Green's trails.

Section B (sample 2479) was measured 50 feet below adjoining section.

For chemical analyses of this coal see part I of this bulletin, p. 42; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31-35, 68-69.

CARBON MOUNTAIN. OUTCROPS.

Sample.—Anthracite coal; Bering River field; analyses Nos. 2496, 2482 (pp. 42, 43).

Location.—Outcrops; Hunt's hillside trail on west side of Carbon Mountain. This coal is possibly the same as that described on the east side of Carbon Mountain.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, about 15 feet, containing no partings; floor and roof, shale.

The beds were measured and sampled by G. C. Martin in 1905.

Section A (sample 2496) included 15 feet of coal; it was measured at north end of Hunt's hillside trail.

Section B (sample 2482) included 10 feet of coal; it was measured at south end of hillside trail.

For chemical analyses of this coal see part I of this bulletin, pp. 42, 43; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31-35, 68.

CLEAR CREEK. PROSPECT, 3 MILES ABOVE MOUTH.

Sample.—Semibituminous coal; Bering River field; analysis No. 4451 (p. 43).

Location.—Prospect on east bank of Clear Creek, 3 miles above its mouth.

Coal bed.—Unnamed; Tertiary age, Kushtaka formation. Thickness, 11 feet with two partings; dip, 67° N.; roof, 3 feet of shale with flaggy sandstone above; floor, sandy shale.

The bed was measured and sampled by G. C. Martin in 1906, as shown below:

Section of coal bed on east bank of Clear Creek, 3 miles above its mouth.

Laboratory No	4451
Roof, shale.	*Ft. in.*
Shale [a]	3 0
Coal	4 0
Diabase sill [a]	4 0
Floor, sandy shale.	
Thickness of bed	11 0
Thickness of coal sampled	4 0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin,-p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31-35, 72.

CLEAR CREEK. TUNNEL NEAR FALLS.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 4431, 4435 (p. 43).

Location.—Tunnel on north bank of Clear Creek near top of falls (laboratory No. 4431), and section at base of Clear Creek Falls (laboratory No. 4435).

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 18 feet with no partings; roof and floor, shale; dip of section at base of falls, 45° NW.

The bed was measured and sampled by G. C. Martin in 1906, as shown below:

Sections of coal bed on north bank of Clear Creek.

Section	A.		B.	
Laboratory No.	4435		4431	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coke (ranges from 6 to 12 inches) [a]	1	0	..	..
Coal	5	0	18	0
Coal [a]	11	0	..	..
Floor, shale.				
Thickness of bed	17	0	18	0
Thickness of coal	5	0	18	0

[a] Not included in sample.

Section A (sample 4435) was measured at base of falls.

Section B (sample 4431) was measured at top of falls.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 72.

CLEAR CREEK. OUTCROP.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 4430, 4460 (p. 43).

Location.—Sections on tributary to Clear Creek, in heading southeast of Monument Mountain; elevation of sample 4460, 1,450 feet, of 4430, 1,200 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness (represented by sample 4460), 8 feet 4 inches; roof and floor, shale; thickness (represented by sample 4430), 15 feet 5 inches; roof, firm shale; dip, 30° NW.

The bed was measured and sampled by G. C. Martin in 1906, as shown below:

Sections of coal bed on tributary to Clear Creek.

Section	A.		B.	
Laboratory No.	4460		4430	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a] 1	4	1	10
Hard shale	[a] 0	7	..	..
Bone	..	..	[a] 0	4
Soft shale with some coal	[a] 1	2	..	..
Coal	..	..	0	11
Shale	[a] 2	3	..	..
Bony coal	..	..	[a] 0	7
Coal	3	0	0	3
Shaly coal	..	..	[a] 0	3
Coal	..	..	3	3
Shale horse	..	..	[a] 5	0
Shaly coal	..	..	[a] 2	0
Coal	..	..	1	0
Floor, shale.				
Thickness of bed	8	4	15	5
Thickness of coal sampled	3	0	6	3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 71.

FALLS CREEK. CHRISTOPHER PROSPECT.

Sample.—Semibituminous coal; Bering River field; analysis No. 2488 (p. 43).

Location.—Christopher prospect, in opening of cliffs of Falls Creek, 1 mile north of Bering Lake; elevation, 110 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 10 feet, with one parting; roof, arkose; floor, sandy shale; dip, 25° NE.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in Christopher prospect, 1 mile north of Bering Lake.

Laboratory No.	2488
Roof, arkose.	Ft. in.
Coal	3 0
Coal and shale[a]	3 0
Coal	4 0
Floor, sand shale.	
Thickness of bed	10 0
Thickness of coal sampled	7 0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 79.

FALLS CREEK. OUTCROP NEAR CHRISTOPHER'S CABIN.

Sample.—Semibituminous coal; Bering River field; analysis No. 4454 (p. 43).

Location.—Section on tributary to Falls Creek, ½ mile northeast of Christopher's cabin; elevation, 200 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 4 feet 9 inches, with several partings; roof, soft shale with probably a little overlying coal; floor, arkose; dip, 60° SE.

The bed was measured and sampled by G. C. Martin in 1906 as shown below:

Section of coal bed on tributary to Falls Creek, ½ mile northeast of Christopher's cabin.

Laboratory No.	4454
Roof, shale, with probably little overlying coal.	Ft. in.
Coal	2 7
Shale[a]	0 7
Coal[a]	0 9
Shale[a]	1 10
Coal[a]	0 5
Coaly shale[a]	0 6
Floor, arkose.	
Thickness of bed	6 8
Thickness of coal sampled	2 7

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 79.

FOURTH BERG LAKE. OUTCROP.

Sample.—Anthracite coal; Bering River field; analysis No. 2478 (p. 43).

Location.—Outcrop, 1¾ miles upcreek from Fourth Berg Lake; elevation, 1,850 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 2 feet 10 inches, containing two partings of coaly shale; roof, dark shale; floor, shale; dip, 55° SW.

The bed was measured and sampled by G. C. Martin in 1905 as shown below:

Section of coal bed 1⅔ miles upcreek from Fourth Berg Lake.

Laboratory No.	2478	
Roof, dark shale.	*Ft.*	*in.*
Coal	0	8
Coaly shale[a]	0	4
Coal	0	11
Coaly shale[a]	0	3
Coal	0	8
Floor, shale.		
Thickness of bed	2	10
Thickness of coal sampled	2	3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 67.

KUSHTAKA RIDGE, EAST SIDE. OUTCROP NORTHWEST OF CABIN.

Sample.—Semibituminous coal; Bering River field; analysis No. 4455 (p. 43).

Location.—Section on Kushtaka ridge, east side, 1 mile northwest of cabin; elevation, 850 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 3 feet, with no partings; dip, 40° NW.; floor and roof, shale.

The bed was measured and sampled by G. C. Martin in 1906. The sample included 3 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 74.

KUSHTAKA RIDGE, EAST SIDE. OUTCROP 1½ MILES NORTHWEST OF CABIN.

Sample.—Semibituminous coal; Bering River field; analysis No. 4428 (p. 43).

Location.—Section on Kushtaka Ridge, east side, 1½ miles northwest of cabin; elevation, 1,600 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 14 feet, with no partings; roof and floor, shale.

The bed was measured and sampled by G. C. Martin in 1906. The sample represented the full section of the bed, 14 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 74.

KUSHTAKA RIDGE. TUNNEL ON EAST FACE.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 2497, 4463 (p. 43).

Location.—Tunnel on east face of Kushtaka Ridge (790 feet above Lake Kushtaka).

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Roof and floor, shale; thickness, 14½ feet, with no partings; dip, 45° NW.

The bed was measured and sampled by G. C. Martin in 1905. The sample represented the full thickness of the bed, 14½ feet of coal. Contains some bone and pyrite.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 75.

LEEPER CREEK. SECTION ⅓ MILE ABOVE MOUTH.

Sample.—Semibituminous coal; Bering River field; analysis No. 4453 (p. 43).

Location.—Section on Leeper Creek, ⅓ mile above its mouth.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 8 to 11 feet; dip, 75° NW. The bed was measured and sampled by G. C. Martin in 1906. The sample represented the thickness of coal in the bed, 8 to 11 feet.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 77.

MOUNT HAMILTON. OUTCROP IN GULCH.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 4436, 4437, 4452 (p. 43).

Location—Outcrop in gulch ⅖ mile southwest of Mount Hamilton; elevation, 1,100 feet.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 50 feet 2 inches, with several partings; roof, shale; floor, shaly sandstone; dip, 52° NW. The coal occurs in two benches separated by 30 feet of shale. There is 5 feet of coal in the upper bench and 10⅔ feet of coal in the lower bench. The lower contains numerous shale partings.

The bed was measured and sampled by G. C. Martin, in 1906, as shown below:

Section of coal bed in gulch ⅖ mile southwest of Mount Hamilton.

Laboratory No.	4436, 4437, 4452	
Roof, shale.	*Ft.*	*in.*
Coal [a]	5	0
Shale at top and bottom, concealed between	30	0
Coaly shale	2	0
Coal (somewhat impure) [b]	1	5
Shale	0	2
Coal with shale streaks [b]	1	4
Shale	0	4
Coal with little shale [b]	1	0
Shaly coal	0	6
Coal [b]	0	9
Shale	1	0
Coal, impure	0	4
Coal [c]	1	8
Shale	0	2
Coal [c]	4	6
Floor, shaly sandstone.		
Thickness of bed	50	2

[a] Included in sample 4437. [b] Included in sample 4452. [c] Included in sample 4436.

For chemical analyses of this coal see part I of this bulletin, p. 43; also U. S. Geol. Survey Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 80.

NEVADA CREEK. TUNNEL NEAR MOUTH.

Sample.—Semibituminous coal; Bering River field; analysis No. 2491 (p. 44).

Location.—Tunnel near mouth of Nevada Creek.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 19 feet 7 inches; roof, dark shale 2 feet; floor arkose, 10 feet; dip, 78° N.

The bed was sampled and measured by G. C. Martin in 1905. The sample represented 19 feet 7 inches of coal, the thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 77.

POWERS CREEK. TUNNEL 1 MILE NORTH OF BERING LAKE.

Sample.—Semibituminous coal; Bering River field; analysis No. 2493 (p. 44).

Location.—Tunnel on Powers Creek 1 mile north of Bering Lake.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 12 feet; floor, sandstone; dip, 35° NW.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in tunnel on Powers Creek 1 mile north of Bering Lake.

Laboratory No	2493	
	Ft.	*in.*
Coal (top concealed) [a]	2	0
Shale [a]	1	6
Coal	8	6
Floor, sandstone.		
Thickness of bed	12	0
Thickness of coal sampled	8	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 79.

QUEEN CREEK. OUTCROP ON NORTHWEST BANK.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 2486, 2495 (p. 44).

Location.—Outcrop on northwest bank of Queen Creek.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness 77 feet, with several partings; roof and floor, shale.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on northwest bank of Queen Creek.

Laboratory No	2486, 2495	
Roof, shale.	*Ft.*	*in.*
Coal [a]	27	0
Shale (pocket?)	7	0
Coal	2	0
Shale	10	0
Coal [b]	31	0
Floor, shale.		
Thickness of bed	77	0

[a] Sample 2486. [b] Sample 2495.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 76.

QUEEN CREEK. OUTCROP.

Sample.—Semibituminous coal; Bering River field; analysis No. 2494 (p. 44).

Location.—Outcrop southwest of Queen Creek.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 98 feet 6 inches, with three partings; roof and floor, shale.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in opening near Queen Creek.

Laboratory No	2494	
Roof, shale.	*Ft.*	*in.*
Coal	17	0
Shale [a]	41	0
Coal [a]	4	0
Shale [a]	5	0
Coal [a]	3	0
Shale [a]	2	6
Coal [a]	26	0
Floor, carbonaceous shale.		
Thickness of bed	98	6
Thickness of coal sampled	17	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 77.

SECOND BERG LAKE. OUTCROP IN GULCH AT HEAD.

Sample.—Anthracite coal; Bering River field; analysis No. 2485 (p. 44).

Location.—Outcrop in gulch at head of Second Berg Lake.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness of coal, 2 feet 8 inches, with no partings; roof, sandstone; floor, sandy shale; dip, 32° NE.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in gulch at head of Second Berg Lake.

Laboratory No	2485	
Roof, sandstone.	*Ft.*	*in.*
Coal, bony [a]	0	6
Coal, hard and bright	2	2
Floor, sandy shale.		
Thickness of bed	2	8
Thickness of coal sampled	2	2

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 67.

TOKUN CREEK. TUNNEL ABOVE LAKE TOKUN.

Sample.—Semibituminous coal; Bering River field; analysis No. 2490 (p. 44).

Location.—Lower tunnel on Tokun Creek, about 1.5 miles above Lake Tokun.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 6 feet 8 inches, with no partings; roof, arkose; floor, shale.

The bed was measured and sampled by G. C. Martin in 1905. The sample represented 6⅔ feet of coal, the thickness of the bed.

For chemical analyses see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 79.

Trout Creek. Cunningham's Upper Tunnel.

Sample.—Semibituminous coal; Bering River field; analyses Nos. 2484, 2489 (p. 44).

Location.—Cunningham's upper tunnel on Trout Creek opposite house, and long tunnel ¼ mile below house on Trout Creek.

Coal beds.—Unnamed; Tertiary age, Kushtaka formation. Thickness, 8 feet and 33 feet; roof and floor, shale; dip, 38°.

The beds were measured and sampled by G. C. Martin in 1905.

Section A (sample 2489) included 8 feet of coal and was taken in tunnel opposite house.

Section B (sample 2484) included 33 feet of coal and was taken in long tunnel ¼ mile below house.

For chemical analyses of this coal, see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 284, p. 74; Bull. 290, p. 230; Bull. 335, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 335, pp. 31–35, 72–73.

COOK INLET.

Kachemak Bay. Prospects.

Sample.—Lignitic coal; Cook Inlet field; analyses Nos. 4457, 4429 (p. 44).

Location.—Prospects; on Kachemak Bay.

Coal bed.—Not named. Tertiary age, Kenai formation.

The beds were measured and sampled by W. W. Atwood in 1908, as described below:

Sample 4457 was taken from an outcrop at a point about 3 miles east of Homer Spit.

Sample 4429 was taken from an outcrop on the north shore of Kachemak Bay, about 1 mile west of Homer Spit, and represented a 6-foot cut.

For chemical analyses of this coal see part I of this bulletin, p. 44; also U. S. Geol. Survey Bull. 379, pp. 125, 126.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, pp. 110–122.

Kachemak Bay. Outcrops.

Sample.—Lignite; Cook Inlet field; analyses Nos. 4426, 4432 (p. 45).

Location.—Outcrops; southeast of Anchor Point.

Coal bed.—Not named. Tertiary age, Kenai formation.

The beds were measured and sampled by W. W. Atwood in 1908, as described below:

Section of lignite bed in prospect ¾ mile west of Diamond Creek.

Laboratory No.	4426	
	Ft.	in.
Carbonaceous shale [a]	1	3
Lignite	0	3
Carbonaceous shale [a]	0	5
Lignite	1	0
Shale [a]	0	2
Lignite	2	7
Floor, clay.		
Thickness of bed	5	8
Thickness of coal sampled	3	10

[a] Not included in sample.

Section of lignite bed in prospect about 1½ miles east of Troublesome Gulch.

Laboratory No.	4432	
Coarse sand.	*Ft.*	*in.*
Lignite	2	0
Carbonaceous shale[a]	0	3
Lignite	1	9
Floor, clay.		
Thickness of bed	4	0
Thickness of coal sampled	3	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 379, pp. 125, 126.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, p. 110.

PORT GRAHAM. OUTCROP.

Sample.—Lignitic coal; Cook Inlet field; analysis No. 4458 (p. 45).

Location.—Outcrop; north shore of Port Graham, on Cook Inlet.

Coal bed.—Not named. Tertiary age, Kenai formation.

The bed was measured and sampled by W. W. Atwood in 1908. The sample represented 8 to 9 feet of coal including some bone.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 379, pp. 125, 126.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, p. 110.

TYONEK. OUTCROPS.

Sample.—Lignitic coal; Cook Inlet field; analyses Nos. 4425, 4464, 4465 (p. 45).

Location.—Outcrops; south of Tyonek on Cook Inlet.

Coal bed.—Not named. Tertiary age, Kenai formation.

The beds were measured and sampled by W. W. Atwood in 1908.

Sample 4425 consisted of some loose lignite pebbles from a conglomerate.

Sample 4465 was taken at a point 4 miles south of Tyonek on the west shore of Cook Inlet near the south end of Tyonek beach.

Sample 4464 was taken at a point 3 miles south of Tyonek, from the first outcrop on the west shore of Cook Inlet.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 379, pp. 125, 126.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, p. 110.

TYONEK. OUTCROPS.

Sample.—Lignite; Cook Inlet field; analyses Nos. 4434, 4456 (p. 45.).

Location.—Outcrops; on Beluga River above canyon and rapids (10 and 10¼ miles up).

Coal bed.—Not named. Eocene (?) age, Kenai formation.

The beds were measured and sampled by W. W. Atwood in 1908.

Sample 4434 was taken 10 miles above canyon and rapids.

Sample 4456 was taken 10¼ miles above canyon and rapids.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 379, p. 125, 126.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, p. 110.

MATANUSKA.

BOULDER AND HICKS CREEKS. OUTCROP.

Sample.—Anthracite coal; Matanuska field; analysis No. 2222 (p. 45).

Location.—Outcrop; on north side of Matanuska Valley between Boulder and Hicks creeks, 18 miles (more or less) from Chickaloon Creek.

Coal bed.—Not named. Age, uncertain.

The bed was measured and sampled by G. C. Martin in 1905; at the point of sampling it was 38 feet thick.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 327, p. 60.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 327, pp. 52–56.

CHICKALOON CREEK. WATSON'S TUNNEL NO. 2.

Sample.—Semibituminous coal; Matanuska field; analysis No. 2215 (p. 45).

Location.—Watson's Tunnel No. 2, Chickaloon Creek.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 15 feet 1 inch, with several partings; dips almost vertical toward mouth of tunnel; roof, 17½ feet of shale; floor, hard shale.

The bed was measured and sampled by G. C. Martin in 1905 as shown below:

Section of coal bed in Tunnel No. 2, Chickaloon Creek.

Laboratory No.	2215	
	Ft.	*in.*
Roof, hard shale.		
Bone	0	10
Coal	0	2
Coal, with some bone	2	5
Coal	1	10
Shale and bone [a]	2	8
Bony coal	0	6
Coal	0	11
Bone	1	11
Coal	2	4
Bone	0	5
Coal	0	8
Bone [a]	0	5
Floor, hard shale.		
Thickness of bed	15	1
Thickness of coal sampled	12	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 27; Bull. 290, p. 230; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 289, p. 19; Bull. 500, pp. 42–52, 72–88.

CHICKALOON CREEK. WATSON'S TUNNEL NO. 2.

Sample.—Semibituminous coal; Matanuska field; analysis No. 2227 (p. 45).

Location.—Watson's Tunnel No. 2, on Chickaloon Creek.

Coal bed.—Not named. Tertiary age, Chickaloon formation.

The bed was measured and sampled by G. C. Martin in 1905; at the point of sampling it was 5.2 feet thick. The sample did not represent the full thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For geologic relations see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

CHICKALOON CREEK. WATSON'S TUNNEL NO. 3, NEAR WATSON'S CAMP.

Sample.—Bituminous coal; Matanuska field; analysis No. 2216 (p. 45).

Location.—Watson's tunnel No. 3 near Watson's camp, Chickaloon Creek.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 23 feet 10 inches, with two partings; dip, 72°, 75°, 83°, NW.; roof, 10 feet of shale; floor, shale with coal streaks 4 feet 10 inches thick.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in Watson's Tunnel No. 3 near Watson's camp, Chickaloon Creek.

Laboratory No	2216	
Roof, shale.	*Ft.*	*in.*
Coal [a]	1	4
Shale [a]	0	6
Bone [a]	0	6
Coal	7	0
Floor, shale with coal streaks.		
Thickness of bed	9	4
Thickness of coal sampled	7	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

CHICKALOON CREEK. WATSON'S TUNNEL NO. 5.

Sample.—Semibituminous coal; Matanuska field; analysis No. 2220 (p. 45).

Location.—Watson's tunnel No. 5, Chickaloon Creek.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 10 feet 10 inches, with two partings; dip, 51° NE.; roof, 10 feet of shale; floor, 28 feet of shale.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed in Watson's tunnel No. 5, Chickaloon Creek.

Laboratory No	2220	
Roof, shale.	*Ft.*	*in.*
Coal	1	8
Shale [a]	0	6
Bony coal	1	8
Shale [a]	0	10
Coal	6	2
Floor, shale.		
Thickness of bed	10	10
Thickness of coal sampled	7	10

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

CHICKALOON CREEK. OUTCROP.

Sample.—Semibituminous coal; Matanuska field; analysis No. 2214 (p. 45).

Location.—Bed on south bank of Matanuska River, 3 miles above mouth of Chickaloon Creek.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 7 feet 7 inches; roof, 10 feet of gray shale; floor, gray shale with ironstone bands.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on Matanuska River, 3 miles above Chickaloon Creek.

Laboratory No.	2214	
	Ft.	*in.*
Roof, gray shale.		
Coal [a]	0	6
Shale [a]	0	1
Coal	7	0
Floor, gray shale with ironstone bands.		
Thickness of bed	7	7
Thickness of coal sampled	7	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

COAL CREEK. OUTCROPS.

Sample.—Semibituminous coal; Matanuska field; analyses Nos. 2217, 2219 (p. 45).

Location.—Outcrops above mouth of Coal Creek.

Coal bed.—Not named. Tertiary age, Chickaloon formation.

The bed was measured and sampled as described below:

Sections of coal bed in outcrops above mouth of Coal Creek.

Laboratory No.	2217		2219	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	2	6	3
Parting	..	..	..	..
Shale	..	..	[a]0	2
Coal	1	5	0	6
Shale	..	..	[a]0	11
Sandstone (varying from 2 to 6 inches)	[a]0	5	..	..
Coal	1	0	[a]0	9
Thickness of bed	5	0	8	7
Thickness of coal sampled	4	7	6	9

[a] Not included in sample.

Sample 2219 was taken ⅗ mile above mouth of Coal Creek.

Sample 2217 was taken ¾ mile above mouth of Coal Creek.

For chemical analyses of this coal see part I of this bulletin, p. 45; also U. S. Geol. Survey Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 62; Bull. 500, pp. 90–91.

For geologic relations see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

ESKA CREEK. OUTCROP.

Sample.—Bituminous coal; Matanuska field; analyses Nos. 2224, 2226 (p. 46).

Location.—Outcrops on west bank of Eska Creek, elevation 875 feet.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 10 feet 2½ inches with several partings; dip, 44° NW.; roof, shale and sandstone 10 feet thick; floor, shale, 6 inches thick, below which are 2 feet of coaly shale.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Sections of coal bed on west bank of Eska Creek.

Section	A		B	
Laboratory No	2226		2224	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale and sandstone.				
Coal	1	3	3	3
Shale [a]	0	1	0	3
Coal [a]	1	4	0	11
Shale [a]	0	1	0	5
Coal, bony [a]	1	3	..	..
Coal	..	..	0	6
Shale [a]	0	½	0	6
Coal	..	..	0	4
Coal, bony [a]	1	1	..	..
Shale [a]	0	1	0	1
Coal	..	..	0	9
Coal with some shale and bone [a]	2	6	..	..
Shale [a]	0	6	..	..
Floor, coaly shale.				
Thickness of bed	8	2½	7	0
Thickness of coal sampled	2	7	3	3

[a] Not included in sample.

Section A was measured 3 miles above trail, at an elevation of 875 feet.

Section B was measured 3 miles above trail, at an elevation of about 1,175 feet.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 284, p. 99; Bull. 289, p. 28; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

Kings Creek. Bed on West Bank.

Sample.—Bituminous coal; Matanuska field; analysis No. 2218 (p. 46).

Location.—Bed in opening on west bank of Kings Creek at upper bridge.

Coal bed.—Unnamed. Tertiary age, Kushtaka formation. Thickness, 9 feet 11 inches; dip, 42° NE.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on west bank of Kings Creek at upper bridge.

Laboratory No	2218	
	Ft.	*in.*
Coal	2	5
Sandstone [a]	0	2
Coal	1	4
Shale [a]	0	1
Coal [a]	1	5
Sandstone [a]	0	1
Bony coal	1	0
Sandstone [a]	0	1
Coal	3	4
Thickness of bed	9	11
Thickness of coal sampled	5	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 27; Bull. 290, p. 231; Bull. 327, p. 60.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 289, p. 19.

Matanuska Valley. Anthracite Ridge. Outcrop.

Sample.—Bituminous coal; Matanuska field; analysis No. 4754 (p. 46).

Location.—Outcrop; in Matanuska Valley, at east end of anthracite ridge.

Coal bed.—Not named. Roof, sandstone; floor, shale.

The bed was measured and sampled by G. C. Martin, as described below:

Section of coal bed in outcrop in Matanuska Valley at east end of anthracite ridge.

Laboratory No	4754	
Roof, sandstone.	*Ft.*	*in.*
Coal [a]	2	6
Coal and shale [a]	0	4
Coal [a]	0	6
Coal and clay [a]	0	2
Coal	0	10
Floor, shale.		
Thickness of bed	4	4
Thickness of coal sampled	0	10

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 327, p. 55.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 327, p. 41.

MOOSE CREEK. BED 4 MILES ABOVE TRAIL.

Sample.—Bituminous coal; Matanuska field; analysis No. 2225 (p. 46).

Location.—Section of coal on Moose Creek , elevation 700 feet.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 8 feet 1 inch; roof, fissile black shale and carbonaceous shale and sandstone, about 1 foot 8 inches thick; floor, 1 foot of shale with 6 feet of massive sandstone underneath; dip, 24° NE.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on Moose Creek.

Laboratory No	2225	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	2
Sandstone [a]	0	1
Bright coal	2	4
Shale [a]	0	6
Bright coal	2	0
Dull coal	1	2
Shale [a]	0	4
Dull coal [a]	1	6
Floor, shale.		
Thickness of bed	8	1
Thickness of coal sampled	5	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 284, p. 99; Bull. 289, p. 28; Bull. 290, p. 231; Bull. 327, p. 61; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

TSADAKA (MOOSE) CREEK, 4½ MILES ABOVE TRAIL. OUTCROP.

Sample.—Bituminous coal; Matanuska field; analysis No. 2221 (p. 46).

Location.—Outcrop, 4½ miles above trail, on east bank of Tsadaka (Moose) Creek, about 100 yards below upper cabin; elevation 780 feet.

Coal bed—Unnamed. Tertiary age, Chickaloon formation. Thickness, 12 feet 8 inches; roof, shale 2 feet thick, overlain with 3 feet of coal with ferruginous inclusions; floor, soft shale with abundant iron ore concretions; dip, 43° NW.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on east bank of Tsadaka Creek, about 100 yards below upper cabin.

Laboratory No	2221	
Roof, shale.	*Ft.*	*in.*
Coal, bright	4	6
Shale[a]	0	2
Coal, bright and hard	7	0
Soft shaly coal[a]	1	0
Floor, soft shale with iron-ore concretions.		
Thickness of bed	12	8
Thickness of coal sampled	11	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 284, p. 99; Bull. 289, p. 28; Bull. 290, p. 231; Bull. 327, p. 61; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

YOUNG CREEK. OUTCROP.

Sample.—Bituminous coal; Matanuska field; analysis No. 2223 (p. 46).

Location.—Outcrop on west bank of Young Creek, 3 miles above trail, at elevation of 1,585 feet.

Coal bed.—Unnamed. Tertiary age, Chickaloon formation. Thickness, 16 feet 6 inches, with one parting; roof, shale 4 feet thick; floor, shale with sandstone bands 15 feet thick; dip, 20° NW.

The bed was measured and sampled by G. C. Martin in 1905, as shown below:

Section of coal bed on west bank of Young Creek.

Laboratory No	2223	
Roof, shale.	*Ft.*	*in.*
Coal	1	0
Shale[a]	15	0
Coal	0	6
Floor, shale, sandstone bands.		
Thickness of bed	16	6
Thickness of coal sampled	1	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 284, p. 98; Bull. 289, p. 28; Bull. 290, p. 231; Bull. 327, p. 60; Bull. 500, pp. 90–91.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 500, pp. 42–52, 72–88.

SEWARD PENINSULA.

CHICAGO CREEK. CHICAGO CREEK MINE.

Sample.—Lignitic coal; Seward Peninsula field; analyses Nos. 6940, 6941, 6942, 6943, 6944, 6945, 6946, 6947, 6948 (p. 46):

Mine.—Chicago Creek; on Chicago Creek, a tributary of Kujruk River, latitude 55° 55′ N., longitude 162° 25′ W.

Coal bed.—Not named. Thickness about 88 feet, with a few thin partings of bone and sandy shale; strike, N. 8° W.; dip, 53° W.

The bed was measured and sampled by F. F. Henshaw in 1908 as described below:

Sample 6940 was taken at a point 60 to 72 feet from hanging wall.

Sample 6941 was taken at a point 36 to 48 feet from hanging wall.

Sample 6942 was taken at a point 12 to 24 feet from hanging wall.

Sample 6943 was taken at a point 48 to 60 feet from hanging wall.

Sample 6944 was taken at a point in crosscut on lowest level, at a point about 12 feet from hanging wall.

Sample 6945 was taken at a point 96 to 104 feet from hanging wall to the foot wall.

Sample 6946 was taken at a point 24 to 36 feet from hanging wall.

Sample 6947 was taken at a point 72 to 84 feet from hanging wall.

Sample 6948 was taken at a point 84 to 96 feet from hanging wall.

For chemical analyses of this coal see part I of this bulletin, p. 46; also U. S. Geol. Survey Bull. 379, p. 363.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 379, p. 362.

SOUTHEASTERN ALASKA (ADMIRALTY ISLAND).

Murder Cove. Prospect.

Sample.—Lignitic (?) coal; Southeastern Alaska field; analysis No. 5796 (p. 47).

Location.—Prospect; at Murder Cove, Southeastern Alaska.

Coal bed.—Not named. Tertiary age, Kenai formation.

For chemical analyses of this coal see part I of this bulletin, p. 47.

For geologic relations see U. S. Geol. Survey Bull. 287, pp. 152–153.

YUKON RIVER.

Charley Creek. Prospect.

Sample.—Bituminous (?) coal; Yukon River field; analysis No. 5794 (p. 47).

Location.—Jim Henderson claim; at Charley Creek, near Copper Creek, Yukon River.

Coal bed.—"No. 2." Tertiary age, Kenai (?) formation.

For chemical analyses of this coal see part I of this bulletin (p. 47).

Williams Creek. Prospect.

Sample.—Lignite (?) coal; Yukon River field; analysis No. 5795 (p. 47).

Location.—Prospect; at Williams Creek, 6 miles out from Eagle, Yukon River.

Coal bed.—"No. 3."

For chemical analyses of this coal see part I of this bulletin (p. 47).

For geologic relations see U. S. Geol. Survey Bull. 218, pp. 55–58.

ARIZONA.

COCONINO COUNTY.

Tuba. Tuba Indian School Mine.

Sample.—Subbituminous (?) coal; Black Mesa field; analysis No. 8122 (p. 47).

Mine.—Tuba Indian school; 14 miles southeast of Tuba, in Navajo Indian Reservation. No railroad connection.

Coal bed.—No name. Cretaceous age, in Mancos shale. Thickness, 4¼ feet.

The bed was measured and sampled on May 15, 1909, by M. R. Campbell. The sample included 4 feet 3 inches of clean coal. It was obtained in an old drift about 100 feet from the entrance. The coal was very dry and was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 47; also U. S. Geol. Survey Bull. 431, p. 237.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 231.

NAVAJO COUNTY.

ORAIBI. ORAIBI INDIAN SCHOOL MINE.

Sample.—Subbituminous (?) coal; Black Mesa field; analysis No. 8123 (p. 47).

Mine.—Oraibi Indian School, 3 miles east of Oraibi, in Hopi Indian Reservation. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde (?) formation.

The bed was measured and sampled on May 19, 1909, by M. R. Campbell, as shown below:

Section of coal bed in Oraibi Indian School mine, 3 miles east of Oraibi.

Laboratory No	8123	
Shale.	*Ft.*	*in.*
Coal[a]	0	11
Bone[a]	0	5
Coal	1	8
Bone[a]	0	3½
Coal	1	5
Thickness of bed	4	8½
Thickness of coal sampled	3	1

[a] Not included in sample.

Sample obtained from two lower benches in main entry, 50 feet from entrance. Coal very dry and probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 47; also U. S. Geol. Survey Bull. 431, p. 237.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 431, p. 231.

ARKANSAS.

FRANKLIN COUNTY.

ALTUS. GARRITZ MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3371 (p. 47).

Mine.—Garritz; Denning-Coal Hill district; in sec. 17, T. 9 N., R. 26 W., 2 miles west of Altus.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age, Spadra shale.

The bed was measured and sampled by Arthur J. Collier in 1906. The sample represented the thickness of the bed, 2 feet 1 inch. It was taken in the center cross entry.

For chemical analyses of this coal see part I of this bulletin, p. 47.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, pp. 143–153; Bull. 326, pp. 50–77.

DENNING. NO. 2 MINE.

Sample.—Semibituminous coal; Arkansas field; analyses Nos. 1040, 1042 (p. 48).

Mine.—No. 2; Denning-Coal Hill district; in sec. 22, T. 9 N., R. 26 W., near Denning.

Coal bed.—Locally known as the Denning, at the Hartshorne horizon (probably identical with the Hartshorne coal of Oklahoma.) Carboniferous (Allegheny) age; Spadra shale. The coal measured 3 feet 7 inches and 4 feet 6 inches, respectively, at the points where the samples were cut.

The bed was measured and sampled by J. W. Groves in 1904, as shown below:

Section of coal bed in No. 2 mine, near Denning.

Laboratory No.	1042	
	Ft.	*in.*
Coal	2	3
Shale	0	3
Coal	2	0
Thickness of bed	4	6
Thickness of coal sampled	4	3

Sample 1040 represented a 43-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 48; also U. S. Geol. Survey Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

JOHNSON COUNTY.

CLARKSVILLE. BROOKS MINE.

Sample.—Semianthracite (?) coal; Arkansas field; analysis No. 3369 (p. 48).

Mine.—Brooks; Spadra district; sec. 17, T. 9 N., R. 23 W., 2 miles south of Clarksville.

Coal bed.—Known as the Spadra, at the Hartshorne horizon (probably identical with the Hartshorne coal of Oklahoma). Carboniferous (Allegheny) age, Spadra shale. Thickness 34 inches, with 2-inch shale parting near the middle.

The bed was measured and sampled by R. D. Mesler, as shown below:

Section of coal bed in Brooks mine at Clarksville.

Laboratory No.	3369	
	Ft.	*in.*
Roof, shale.		
Coal	1	7
Shale [a]	0	2
Coal	1	1
Thickness of bed	2	10
Thickness of coal sampled	2	8

[a] Not included in sample.

The sample was taken from one of the working faces of the mine.

The mine shaft is 240 feet deep.

For chemical analyses of this coal see part I of this bulletin, p. 48; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

COAL HILL. NO. 4 MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 5) analyses Nos. 1130, 1131 (p. 48).

Mine.—No. 4; Denning-Coal Hill district; 1½ miles west of Coal Hill, in sec. 19, T. 9 N., R. 25 W., on the Missouri Pacific Railroad.

Coal bed.—Locally known as the Denning (at the Hartshorne horizon probably identical with the Hartshorne coal of Oklahoma). Carboniferous (Allegheny) age, Spadra shale. Dip irregular, being nearly horizontal. The mine shaft is 135 feet deep. Roof and floor, hard shale.

Two mine samples were collected by J. W. Groves in 1904, at points showing the following sections:

Sections of coal bed in No. 4 mine, 1½ miles west of Coal Hill.

Section	A		B	
Laboratory No.	1130		1131	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3½	1	5
Shale mixed with coal [a]	0	5½	0	7
Coal with streaks of sulphur and shale	2	0	1	9
Floor, hard shale.				
Thickness of bed	3	9	3	9
Thickness of coal sampled	3	3½	3	2

[a] Not included in sample.

Section A (sample 1130) was measured in room 45, off the east slope, entry 3.

Section B (sample 1131) was measured in room 38, off east entry 2, on east plane.

Notes.—The coal from this mine, in common with the coal from many other Arkansas mines, is soft and friable; much slack is made in mining and preparation, and separation of the shale and the sulphur is difficult without washing. In 1904 about 60 per cent of the output was used by the Missouri Pacific Railway for engine fuel. The slack was generally sold to Kansas City packing houses.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 409; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 58; producer-gas tests: U. S. Geol. Survey briquetting tests: U. S, Geol. Survey Prof. Paper 48, p. 1434; Bull. 261, p. 151.

For chemical analyses see part I of this bulletin, p. 48; also U. S. Geol. Survey Prof. Paper 48, p. 202; Bull. 261, p. 34; Bull. 316, p. 159; Bull. 326, p. 98.

Coal Hill. Black Diamond Mine.

Sample.—Semianthracite coal; Arkansas field; analyses No. 3370 (p. 48).

Mine.—Black Diamond; Denning-Coal Hill district; in the SW. ¼ sec. 30, T. 9 N., R. 25 W., 2½ miles southwest of Coal Hill.

Coal bed.—Denning, on the Hartshorne horizon and probably identical with the Hartshorne coal of Oklahoma; Carboniferous (Allegheny) age, Spadra shale.

The bed was measured and sampled by C. D. Smith in 1906.

The sample was taken from one of the working faces where the bed was 3½ feet thick with a ½-inch parting near the middle.

For chemical analyses of this coal see part I of this bulletin, p. 48; also U. S. Geol. Survey Bull. 316, p. 159; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

Spadra. Consolidated Anthracite No. 1 Mine.

Sample.—Semianthracite coal; Arkansas field; (Arkansas No. 8) analyses Nos. 2587, 2588 (p. 48).

Mine.—Consolidated Anthracite No. 1; at Spadra, on the St. Louis, Iron Mountain & Southern Railway.

Coal bed.—Spadra, locally known as Arkansas anthracite; probably same as Hartshorne of Oklahoma. Carboniferous (Allegheny) age, Spadra shale. Bed nearly horizontal, dipping 5° N.; opened by shaft 87 feet deep; average thickness, 2 feet 10 inches; roof, gray laminated shale; floor, gray shale, in places hard.

The bed was sampled by W. J. Von Borries and J. W. Groves on November 27, 1904, at two points, which showed the following sections:

Sections of coal bed in Consolidated Anthracite No. 1 mine at Spadra.

Section	A		B	
Laboratory No.	2587		2588	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	1	5
Shale [a]	0	3	0	3
Coal	1	2	1	4
Floor, shale.				
Thickness of bed	2	11	3	0
Thickness of coal sampled	2	8	2	9

[a] Not included in sample.

Section A (sample 2587) was from a point 1,300 feet northeast of shaft, east entry 6.

Section B (sample 2588) was from a point 1,650 feet northwest of shaft, west entry 8.

Notes.—The Spadra coal is widely used as domestic fuel. At this mine, in 1904, six sizes were produced by screening; the slate was separated by mechanical pickers. The slack was that which passed through a ⅜-inch screen.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 70; Bureau of Mines Bull. 23, pp. 58, 147; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 70: Bureau of Mines Bull. 13, pp. 105, 272; washing tests: U. S. Geol. Survey Bull. 332, p. 71; Bull. 336, p. 17.

For chemical analyses see part I of this bulletin, p. 48; also U. S. Geol. Survey Bull. 332, p. 69.

SPADRA. EUREKA MINE.

Sample.—Semianthracite coal; Arkansas field; analysis No. 3368 (p. 49).

Mine.—Eureka, Spadra district; in the SW. ¼ sec. 14, T. 9 N., R. 24 W., near Spadra.

Coal bed.—Spadra; probably equivalent to Hartshorne of Oklahoma. Carboniferous (Allegheny) age, Spadra shale. Thickness 44 inches, with a parting 3 inches or more near the middle. The coal is mined from a shaft 140 feet deep.

The bed was measured and sampled by C. D. Smith in 1906, as shown below:

Section of coal bed in Eureka mine near Spadra.

Laboratory No.	3368	
Roof, shale.	*Ft.*	*in.*
Coal	1	4
Parting [a]	0	6
Coal	1	10
Thickness of bed	3	8
Thickness of coal sampled	3	2

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 316, p. 159; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 68.

SPADRA. NEEDMORE MINE.

Sample.—Semianthracite coal; Arkansas field; analysis No. 3407 (p. 49).

Mine.—Needmore, Spadra district; in sec. 23, T. 9 N., R. 24 W., near Spadra.

Coal bed.—Spadra, on the Hartshorne horizon, and equivalent to the coal mined at Jenny Lind and Huntington, Ark., and Hartshorne, Okla. Carboniferous (Allegheny) age, Spadra shale.

The sample was taken by R. D. Mesler from one of the working faces, where the coal is 3 feet 5 inches thick with a 2-inch shale parting near the middle.

Section of coal bed in Needmore mine near Spadra.

Laboratory No	3407
Roof, shale.	*Ft. in.*
Coal	1 5
Parting[a]	0 2
Coal	1 10
Floor, sandstone.	
Thickness of bed	3 5
Thickness of coal sampled	3 3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S.Geol. Survey Bull. 316, p. 159; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

LOGAN COUNTY.

PARIS. PARIS MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3174 (p. 49).

Mine.—Paris; Paris district; in sec. 10, T. 7 N., R. 26 W., at Paris.

Coal bed.—Known as the Paris. Carboniferous (Allegheny) age, Paris shale. It is from 1,000 to 1,400 feet vertically above the Hartshorne coal and from 400 to 600 feet above the Charleston coal. Roof, firm sandstone, underlain with half a foot or more of draw slate; floor, a thin bed of fire clay.

The sample was taken from one of the working faces in the deepest part of the mine, and represents a thickness of 26 inches without partings.

The bed was measured and sampled in 1906 by C. D. Smith.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U.S. Geol. Survey Bull. 316, p. 159; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

OUACHITA COUNTY.

LESTER. LESTER NO. 2 MINE.

Sample.—Lignite; Arkansas field; (Arkansas No. 10) analyses Nos. 2647, 2648 (p. 49).

Mine.—Lester No. 2; a drift mine, 7 miles west of Lester, on the St. Louis, Iron Mountain & Southern Railway.

Coal bed.—Unnamed. Tertiary age, Wilcox formation. Thickness, 5 to 8 feet, averaging 6 feet or 5½ feet where worked; roof, gray clay; floor, clay.

Two samples were taken by W. J. Von Borries on December 14, 1905, at measured sections of the coal exposed.

Section A (sample 2647) represented 6 feet 6 inches of lignite. The sample was taken in left entry 2, 300 feet from the drift mouth.

Section B (sample 2648) represented 5 feet of lignite. It was taken in the air course, 300 feet from the drift mouth.

The sections did not represent the full thickness of the bed.

Notes.—This lignite, in 1905, had only a local use, as it slacks quickly on exposure and will not stand storage nor transportation to any considerable distance. The bed was worked from an outcrop.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 73; Bureau of Mines Bull. 23, pp. 58, 147; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 74; Bureau of Mines Bull. 13, pp. 106, 272.

For chemical analyses see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 332, p. 73.

POPE COUNTY.

RUSSELLVILLE. SOUTHERN MINE.

Sample.—Semianthracite coal; Arkansas field; analysis No. 3176 (p. 49).

Mine.—Southern; Spadra district; in the Shinn Basin south of Russellville. Sample 3177 was taken in sec. 22, T. 7 N., R. 20 W.; sample 3176 was taken in sec. 21, T 7 N., R. 20 W.

Coal bed.—Shinn Basin (on the Hartshorne horizon and may be identical with coal mined in the western part of the field at Huntington and Jenny Lind, Ark., and Hartshorne, Okla.). Carboniferous (Allegheny) age, Spadra shale. Thickness, 30 to 36 inches.

The bed was measured and sampled by C. D. Smith in 1906, as shown below:

Section of coal bed in Southern mine at Russellville.

Laboratory No.	3176	
	Ft.	*in.*
Roof, shale.		
Coal (varying up to 10 in.)	0	8
Parting [a] (varying up to 10 in.)	0	6
Coal (varying up to 2 ft. 10 in.)	1	10
Floor, sandstone.		
Thickness of bed	3	0
Thickness of coal sampled	2	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 316, p. 159; and Bull. 326, p. 99.

For geologic relations of bed see U. S. Geol. Survey Bull. 326, pp. 49, 68.

RUSSELLVILLE. RUSSELLVILLE MINE.

Sample.—Semianthracite coal; Arkansas field; analysis No. 3177 (p. 49).

Mine.—Russellville; Spadra district; in the Shinn Basin south of Russellville in sec. 21, T. 7 N., R. 20 W.

Coal bed.—Shinn Basin (on the Hartshorne horizon and may be identical with coal mined in the western part of the field at Huntington and Jenny Lind, Ark., and Hartshorne, Okla.). Carboniferous (Allegheny) age, Spadra shale. Thickness, 30 to 36 inches.

The bed was measured and sampled in 1906 by C. D. Smith, as shown below:

Section of coal bed in Russellville mine south of Russellville.

Laboratory No.	3177	
	Ft.	*in.*
Coal	0	9
Shale [a]	0	8
Coal	2	0
Thickness of bed	3	5
Thickness of coal sampled	2	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 316, p. 159: Bull. 326, p. 99.

For geologic relations see U. S. Geol. Survey Bull. 326, pp. 49, 68.

SCOTT COUNTY.

BATES. SEYMOUR MINE.

Sample.—Bituminous coal; Arkansas field; analyses Nos. 3503, 3505 (p. 49).

Mine.—Seymour; Bates-Coaldale district; in the NE. ¼ NW. ¼ sec. 21, T. 3 N., R. 32 W., at Bates.

Coal bed.—Hartshorne. The coal is of Carboniferous (Allegheny) age, Spadra shale.

The bed was measured and sampled at two points by C. D. Smith in 1906, as described below:

Sections of coal bed in Seymour mine at Bates.

Laboratory No.	3505		3503	
	Ft.	*in.*	*Ft.*	*in.*
Coal	[a]2	0	2	0
Shale	[a]0	3	0	3
Coal	[a]2	0	2	0
Shale	[a]2	0	2	0
Coal	[a]2	0	2	0
Shale	[a]2	6	[a]2	6
Coal	4	0	[a]4	0
Thickness of bed	14	9	14	9
Thickness of coal sampled	4	0	8	3

[a] Not included in sample.

Sample 3503 represented the three upper benches of the mine, including the partings, and was obtained by boring a hole upward from the roof of the lower bench through the upper three benches, the cuttings from the auger being taken as a sample.

Note.—Only the lower bench of the bed was mined.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 50–77; Bull. 316, pp. 143–153.

SEBASTIAN COUNTY.

AUBURN. COAL RIDGE MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3218 (p. 49).

Mine.—Coal Ridge; Bonanza-Jenny Lind district; in sec. 20, T. 7 N., R. 29 W., a few miles north of Auburn.

Coal bed.—Charleston (variously known locally as the Sky vein, Coal Ridge vein, etc.). Carboniferous (Allegheny) age, Fort Smith formation. Thickness, 18 inches without partings; roof, sandstone; floor, sandstone. The bed is stratigraphically from 800 to 900 feet above the Hartshorne horizon and is provisionally correlated with that formerly worked near Caulkesville, Central, Fort Smith, and other places, and is believed to be at about the same horizon as the Philpot bed north of Coal Hill.

The sample, representing an 18-inch cut, was taken by Sidney Paige in 1906 from a small drift worked occasionally at the west end of Coal Ridge. The face from which it was cut had probably been exposed to the air for several months.

Note.—This bed had supplied coal for neighborhood use from a number of strip pits and other openings near Charleston.

For chemical analyses of this coal see part I of this bulletin, p. 49; also U. S. Geol. Survey Bull. 316, p. 159; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 77.

BONANZA. NO. 26 MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 9) analyses Nos. 2599, 2600 (pp. 49, 50).

Mine.—No. 26; 2 miles east of Bonanza on the St. Louis & San Francisco Railroad.

Coal bed.—Hartshorne, also known locally as Huntington. Carboniferous (Allegheny) age, Spadra shale. Dip, 5° to 10° N.; thickness, 2 feet 6 inches to 4 feet, averaging 3 feet, with a persistent shale parting; roof, laminated gray shale; floor, laminated gray shale. Mine shaft 250 feet deep.

Mine samples were taken on December 5, 1905, by J. W. Groves and W. J. von Borries at two points as described below:

Sections of coal bed in No. 26 Mine, 2 miles east of Bonanza.

Section	A		B	
Laboratory No.	2599		2600	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	2	1	6
Mother coal and a bad shale[a]	0	¼	0	1
Coal	1	0	0	6
Shale[a]	0	1½	0	2
Coal	0	10	0	11
Floor, shale.				
Thickness of bed	3	1¾	3	2
Thickness of coal sampled	3	0	2	11

[a] Not included in sample.

Section A (sample 2599) was measured 1,400 feet southeast of shaft, main east entry.

Section B (sample 2600) was measured 1,100 feet west of shaft, room 16, main west entry.

Notes.—The coal from this mine, like that from some other mines in the district, is soft and granular and breaks down in mining. The rated capacity of the mine in 1905 was about 1,000 tons daily.

For results of tests of this coal, see mention of specific tests as follows: Washing tests: U. S. Geol. Survey Bull. 332, p. 71; Bull. 336, p. 13; coking tests: U. S. Geol. Survey Bull. 332, p. 71; Bull. 336, pp. 21, 27, 36; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 72; Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses see part I of this bulletin, pp. 49, 50; also U. S. Geol. Survey Bull. 332, p. 71.

For geologic relations of bed see U. S. Geol. Survey Bull. 326, p. 51.

BONANZA. NO. 12 MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 2) analyses Nos. 1049, 1053, (p. 50).

Mine.—No. 12; Bonanza-Jenny Lind district; a slope mine, about 1 mile east of Bonanza on the St. Louis & San Francisco Railroad and the Kansas City Southern Railway.

Coal bed.—Hartshorne, also known locally as Huntington. Carboniferous (Allegheny) age, Spadra shale. The mine is on the southern edge of a broad synclinal trough, the coal dipping north about 6 feet in 100 feet. The bed is 3 feet 10 inches to 4 feet 2 inches thick, with a bone coal parting. The roof is of shale and good; the floor is shale.

Two samples were collected by M. R. Campbell at points in the mine as described below:

Sections of coal bed in No. 12 mine, 1 mile east of Bonanza.

Section	A		B	
Laboratory No.	1053		1049	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	5	2	2
Shale[a]	0	1½	0	2½
Coal	1	2	1	3½
Floor, shale.				
Thickness of bed	3	8½	3	8
Thickness of coal sampled	3	7	3	5½

[a] Not included in sample.

Section A (sample 1053) was measured in east entry 4, and Section B (sample 1049) was measured in west entry 7.

Notes.—The coal, like some other Arkansas bituminous coals, is friable and makes considerable slack, nearly 30 per cent; the slack, what passed through a 1¼-inch screen, containing much of the best part of the coal. In 1904 about 55 per cent of the output was sold for locomotive fuel; about 30 per cent, the slack, went to Kansas City packing houses, and about 15 per cent to factories.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 361; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 58; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1431; Bull. 261, p. 148; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1329; Bull. 261, p. 122.

For chemical analyses see part I of this bulletin, p. 50; also U. S. Geol. Survey Prof. Paper 48, p. 199; Bull. 261, p. 33; Bull. 326, p. 96.

For geologic relations see U. S. Geol. Survey Bull. 326, p. 51.

Burma. Sunshine Shaft.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3148 (p. 50).

Mine.—Sunshine shaft; Greenwood-Huntington district; a partially developed mine located about ⅜ mile northeast of the Red Rock mine, in sec. 20, T. 5 N., R. 31 W., near Burma Station.

Coal bed.—Hartshorne (known locally as Huntington). Carboniferous (Allegeny age), Spadra shale. The bed is not as thick as that mined in the Red Rock mine.

The mine was sampled by C. D. Smith in 1906. The sample represented 3 feet of coal.

Notes.—About 4 inches of the coal near the top is thrown out in mining. The coal, which is hand picked and sacked, is used for blacksmithing purposes.

For chemical analyses of this coal see part I of this bulletin, p. 50; also U. S. Geol. Survey Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

Burma. Mammoth Vein No. 1 Mine.

Sample.—Semibituminous coal; Arkansas field; analyses Nos. 1066, 1068 (p. 50).

Mine.—Mammoth Vein No. 1; Carboniferous (Allegheny) age, Spadra shale, at Burma, in sec. 1, T. 4 N., R. 32 W., on the Midland Valley Railroad.

Coal bed.—Locally known as the Mammoth; on the Hartshorne horizon and is equivalent to the Hartshorne coal. Dip, about 10°; roof, sandstone, with ½ to 2 inches of shale in places between coal and sandstone; floor, smooth black shale, 2 to 3 inches thick; below the shale is 1 foot of coal and below this coal is fire clay.

The bed was measured and sampled at four points by J. W. Groves in September, 1904, as described below:

Sections of coal bed in Mammoth Vein No. 1 mine at Burma.

Section	A		B		C		D	
Laboratory No.	1066		....		1068		....	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal with streaks of sandstone and shale	4	5	4	6	4	5	4	1
Soft shale [a]	0	11½	0	10	1	0	0	9
Coal	3	2½	3	1	3	0	3	0
Floor, shale.								
Thickness of bed	8	7	8	5	8	5	7	10
Thickness of coal sampled	7	7½	7	7	7	5	7	1

[a] Not included in sample.

For chemical analyses of coal see part I of this bulletin, p. 50; also U. S. Geol. Survey Prof. Paper 48, p. 49; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 60.

BURMA. WOODSON'S SLOPE AND STRIP PIT.

Sample.—Semibituminous coal; Arkansas field; analyses Nos. 3155, 3156 (p. 50).

Mine.—Woodson's slope and strip pit; Greenwood-Huntington district; in sec. 19, T. 5 N., R. 31 W., near Burma, near the line of the St. Louis & San Francisco Railroad.

Coal bed.—This bed is regarded as equivalent to coal mined at Hartshorne, Okla.; Carboniferous (Allegheny) age, Spadra shale. Thickness, 3 feet 7 inches, without partings; roof, shale; floor, shale.

The bed was sampled at two points by C. D. Smith. Each sample represented 3 feet 7 inches of coal. Sample 3156 was collected from the face of a slope near railroad for comparison with sample 3155 to determine the effect of weathering on the coal. The analyses of the two samples, however, nearly coincide and indicate that the coal is stable and only slightly affected by weathering.

Notes.—At this place the coal has been mined by stripping for half a mile or more along the outcrop and laboratory No. 3155 was taken from a face exposed in the pits. Where the dip of the coal has carried it to such a depth as to make strip mining impracticable, short slopes have been driven from the face as exposed.

For chemical analyses of this coal see part I of this bulletin, p. 50; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 66.

BURMA. RED ROCK MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3154 (p. 51).

Mine.—Red Rock; Greenwood-Huntington district; in sec. 20, T. 5 N., R. 31 W., at Burma Station.

Coal bed.—Hartshorne. The coal is regarded as equivalent to that mined at Hartshorne, Okla.; Carboniferous (Allegheny) age; Spadra shale. Thickness 36 inches; roof, hard sandstone; floor, sandy slate.

The mine was sampled in 1906 by C. D. Smith and A. J. Collier, the sample including 3 feet of coal.

The mine, when sampled, was worked from a shaft about 60 feet deep.

For chemical analyses of this coal see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49,66.

BURMA. DENMAN MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3158 (p. 51).

Mine.—Denman; Greenwood-Huntington district; in sec. 19, T. 5 N., R. 31 W., near Burma Station.

Coal bed.—Hartshorne (Hartshorne horizon and regarded as equivalent to coal mined at Hartshorne, Okla.). Carboniferous (Allegheny) age, Spadra shale. Average thickness, 36 inches, overlain by a thick bed of hard sandstone; in the western part of the workings shale of varying thickness intervenes between the coal and the sandstone; roof, shale; floor, shale.

The mine was sampled in 1906 by C. D. Smith, the sample representing 3 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 66.

FORT SMITH. MONTGOMERY AND JONES MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3372 (p. 51).

Mine.—Montgomery and Jones; Bonanza-Jenny Lind district; in sec. 30, T. 8 N., R. 31 W., on Massard Prairie, about 5 miles from Fort Smith.

Coal bed.—Hartshorne (regarded as equivalent to the bed mined at Jenny Lind and Bonanza); Carboniferous (Allegheny) age; Spadra shale. Thickness, 27 to 30 inches, with a shale parting less than 1½ inches thick. Upper bench is said to be softer and freer from impurities than the lower.

The sample was collected in 1906 by C. D. Smith from a working face under a cover of about 30 feet. The section follows:

Section of coal bed in Montgomery and Jones mine, 5 miles from Fort Smith.

Laboratory No	3372	
	Ft.	*in.*
Roof, shale.		
Coal	1	10
Shale [a]	0	1½
Coal	0	8
Thickness of bed	2	7½
Thickness of coal sampled	2	6

[a] Not included in sample.

The mine is a small one, producing, when sampled, only 2 or 3 tons of coal per day.

For chemical analyses of this coal see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 54.

GREENWOOD. BANNER MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3175 (p. 51).

Mine.—Banner; Greenwood-Huntington district; in sec. 16, T. 6 N., R. 30 W., a few miles east of Greenwood. Total thickness, about 8 feet, 5 feet of which, in one bench, is mined.

Coal bed.—Hartshorne (Huntington); Carboniferous (Allegheny) age, Spadra shale. The bed was measured and sampled in 1906 by C. D. Smith, as shown below:

Section of coal bed in Banner mine, east of Greenwood.

Laboratory No	3175	
	Ft.	*in.*
Shaly coal and shale [a]	2	6
Coal	5	3
Shale and bone [a]	0	3
Thickness of bed	8	0
Thickness of coal sampled	5	3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 56.

GREENWOOD. GREENWOOD NO. 1 MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3173 (p. 51).

Mine.—Greenwood No. 1; Greenwood-Huntington district; in sec. 12, T. 6 N., R. 31 W., near Greenwood.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age; Spadra shale. Thickness, 4 feet to 7 feet, separated into two benches by a parting of soft shale near the center; parting varies from a thin layer to 6 inches.

The bed was measured and sampled in 1906 by C. D. Smith, as shown below:

Section of coal bed in Greenwood No. 1 mine, near Greenwood.

Laboratory No	3173
Roof, shale.	*Ft. in.*
Coal	3 0
Parting [a]	0 6
Coal	3 0
Thickness of bed	6 6
Thickness of coal sampled	6 0

[a] Not included in sample.

The sample was taken from a working face in the lower part of the mine, as far as possible from the outcrop.

For chemical analyses of this coal see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 59.

HACKETT. BATES & MCWILLIAMS MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3157 (p. 51).

Location.—Bates & McWilliams; Greenwood-Huntington district; in sec. 18, T. 6 N., R. 31 W., 2 miles east of Hackett.

Coal bed.—Hartshorne (Huntington). Carboniferous (Allegheny) age, Spadra shale. Thickness, 32 inches, without partings. The coal is in the eastern extension of the bed mined at Hackett, Ark., and at Panama, Okla., and is almost identical in character but divided by partings. At Greenwood, a few miles farther east, it is very much thicker but divided by partings.

The sample was taken by Sidney Paige from a clean, dry working face. The sample included 2 feet 10 inches of coal.

For chemical analyses see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 56.

HACKETT. HACKETT CITY MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3497 (p. 51).

Mine.—Hackett City; Greenwood-Huntington district; in sec. 21, T. 6 N., R. 32 W., ½ mile west of Hackett.

Coal bed.—Hartshorne. The coal is of Carboniferous (Allegheny) age; Spadra shale.

The bed was measured and sampled in 1906 by C. D. Smith. The sample was taken from a 3-foot 8-inch cut. The sample was wet.

For chemical analyses of this coal see part I of this bulletin, p. 51.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, pp. 143–153; Bull. 326, pp. 50–77.

HARTFORD. PATTERSON NO. 1 MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3500 (p. 51).

Mine.—Patterson No. 1; Greenwood-Huntington district; in the NE. ¼ SE. ¼ sec. 14, T. 4 N., R. 32 W., about 2 miles northeast of Hartford.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age; Spadra shale. Thickness, 62 inches, with a 10-inch clay parting near the bottom; lower bench not mined.

Only the upper bench, 3 feet 6 inches thick, is represented by the sample, which was collected in 1906 by C. D. Smith from one of the working faces, as shown on the following page:

Section of coal bed in Patterson No. 1 mine, 2 miles east of Hartford.

Laboratory No.	3500	
Roof, sandstone.	*Ft.*	*in.*
Coal	3	6
Clay [a]	0	10
Coal [a]	0	10
Floor shale.		
Thickness of bed	5	2
Thickness of coal sampled	3	6

[a] Not included in sample.

For chemical analyses see part I of this bulletin, p. 51; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, pp. 49, 62.

HUNTINGTON. NO. 3 MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 1 and No. 1B) analyses Nos. 1045, 1046, 2585, 2586 (p. 51).

Mine.—No. 3; Greenwood-Huntington district; 1 mile west of Huntington, on the St. Louis & San Francisco Railroad.

Coal bed.—Hartshorne (Huntington). Carboniferous (Allegheny) age; Spadra shale. Mine lies in center of synclinal basin, plunging to west. Worked by shaft 110 feet deep. Roof, sandstone and shale; floor, shale. The bed has three benches.

Four sections were measured and sampled—two (A and B) by M. R. Campbell in 1904, and two (C and D) by J. W. Groves and J. R. Von Borries on December 5, 1905, as described below:

Sections of coal bed in No. 3 mine, 1 mile west of Huntington.

Section	A		B	
Laboratory No.	1045		1046	
	Ft.	*in.*	*Ft.*	*in.*
Coal	4	0	3	10
Shale and coal [a]	0	10	1	0
Coal	0	6	0	6
Shale, black [a]	0	5	0	5
Coal	1	10	2	9
Thickness of bed	7	7	8	6
Thickness of coal sampled	6	4	7	1

Section	C		D	
Laboratory No.	2585		2586	
Roof, section C, slate; section D, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	1	5
Shale [a]	0	1	0	1
Coal	1	4	2	7
Shale, soft [a]	0	1½	0	10
Coal	0	8	0	6
Shale, soft [a]	0	11	0	4
Coal	0	3	2	0
Shale [a]	0	1		
Coal	0	3		
Shale, soft [a]	0	3½		
Coal	1	8		
Floor, shale.				
Thickness of bed	7	4	7	9
Thickness of coal sampled	5	10	6	6

[a] Not included in sample.

Section A (sample 1045) was measured in east entry 4 on the north side of the mine, and section B (sample 1046) was measured in east entry 4 on the south side.

Section C (sample 2585) was measured in east entry 7, off the main south entry, ½ mile south of the shaft, and section D (sample 2586) in the back entry, first dip, 900 feet west of the shaft.

Notes.—The bed is in places rather dirty. The coal is soft and friable and at the time of sampling there was considerable slack made. The output in 1904 was largely used as engine coal by the St. Louis & San Francisco Railroad Co. The grades were lump, steam lump, coarse slack, and slack. What passed through a 1⅝-inch screen (nearly 25 per cent of the total) was sold to Kansas City packing houses, but at some seasons of the year this slack was treated as waste. The capacity of mine No. 3 in 1904 was about 800 tons daily.

For results of tests of this coal, see mention of specific tests as follows—Steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 345; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 58; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1430; Bull. 261, p. 148; washing tests: U. S. Geol. Survey Bull. 332, p. 64; Bull. 336, p. 13; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1328; Bull. 261, p. 122; Bull. 332, p. 64; Bull. 336, pp. 21, 27, 36. Cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 65; Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses see part I of this bulletin, p. 51; also U. S. Geol. Survey Prof. Paper 48, p. 198; Bull. 261, p. 33; Bull. 332, p. 64.

For geologic relations see U. S. Geol. Survey Bull. 326, p. 56.

JENNY LIND. NO. 17 MINE.

Sample.—Semibituminous coal; Arkansas field; analyses Nos. 1030, 1031, 3149, 3153 (pp. 51, 52).

Mine.—No. 17; Bonanza-Jenny Lind district; a shaft mine 212 feet deep, in the SW. ¼ sec. 32, T. 7 N., R. 31 W., at Jenny Lind, on the Missouri Pacific Railway.

Coal bed.—Hartshorne. The coal is of Carboniferous age; Spadra shale. Thickness, fairly uniform; dip, 2½° N.

The bed was measured and sampled at four points, as described below:

Sections of coal bed in No. 17 mine, at Jenny Lind.

Laboratory No.	3149, 3153	
	Ft.	*in.*
Coal	3	0
Shale[a]	0	4
Coal	3	0
Thickness of bed	6	4
Thickness of coal sampled	6	0

[a] Not included in sample.

Sample 3153 was taken by C. D. Smith in 1906 from one of the west entries.

Samples 1030 and 1031 were taken by J. W. Groves on August 27, 1904; each sample included 6 feet of coal.

Note.—The coal is soft and friable, yielding in 1904 about 30 per cent fine coal.

For chemical analyses of this coal see part I of this bulletin, pp. 51, 52; also U. S. Geol. Survey Bull. 316, p. 159.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 51.

JENNY LIND. NO. 18 MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 3) analyses Nos. 1115 and 1118 and analysis No. 3151 (p. 52).

Mine.—No. 18; Bonanza-Jenny Lind district; in sec. 36, T. 7 N., R. 32 W., near Jenny Lind, on the Missouri Pacific Railway.

Coal bed.—Known locally as the Jenny Lind, and is probably the same as the Hartshorne, Carboniferous (Allegheny) age; Spadra shale. Dip, lightly north. Mine shaft 265 feet deep. "Horsebacks" affect the continuity of the bed; in places the coal is entirely replaced by shale. Roof, strong, being a hard shale; floor, soft clay with hard clay a few inches below.

Five sections of the bed were measured. Two sections, A and B, were sampled in 1904 by J. W. Groves, and two, C and D, were measured but not sampled. Subsequently one section, E, was measured and sampled by Sidney Paige. The sections follow:

Sections of coal bed in No. 18 mine, near Jenny Lind.

Section	A	B	C	D	E
Laboratory No	1115	1118			3151
Roof, sandstone; No. 3151, shale.	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*
Coal	2 ½	2 0	1 2	2 2	3 2
Shale[a]	0 3½	0 3	0 ½	0 2½	0 2
Coal	2 4	1 6	2 10	1 4	1 2
Floor, soft clay.					
Thickness of bed	4 8	3 9	4 ½	3 8½	4 6
Thickness of coal sampled	4 4½	3 6	4 0	3 6	4 4

[a] Not included in sample.

Sample 1115 was taken in the main east slope.

Sample 1118 was taken from the main west slope.

Sections C and D were measured at widely separated points.

Note.—The coal from this mine, like that from some other mines in this district, is soft and friable and produces much slack in mining and preparation. In 1904 more than half the output was used by the Missouri Pacific Railway for locomotives. The daily capacity was about 530 tons.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 377; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 58; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1431; Bull. 261, p. 149; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1329; Bull. 261, p. 122.

For chemical analyses see part I of this bulletin, p. 52; also U. S. Geol. Survey Prof. Paper 48, p. 200; Bull. 261, p. 34.

For geologic relations, see U. S. Geol. Survey Bull. 326, p. 49.

MIDLAND. MAMMOTH VEIN MINE.

Sample.—Semibituminous coal; Arkansas field; (Arkansas No. 7) analyses Nos. 2593, 2594 (p. 52).

Mine.—Mammoth Vein; Greenwood-Huntington district, 4 miles southwest of Midland, on the Midland Valley Railroad.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age, Spadra shale. Dip 10° N. W.; worked by a slope; thickness averages about 7 feet, with several shale partings that are thrown out in mining; roof, sandstone with 4 inches of bone coal below in places; floor, smooth, hard, black shale about 3 inches thick, with usually 5 or 6 inches of coal below.

Two samples were collected by E. W. Parker and J. W. Groves on November 24, 1905, as described below:

Sections of coal bed in Mammoth Vein mine, 4 miles southeast of Midland.

Section	A	B
Laboratory No	2593	2594
Roof, sandstone.	*Ft. in.*	*Ft. in.*
Bone[a]	.. ..	0 4
Coal[a]	0 4	.. ..
Coal	3 11	3 11
Dirt[a]	0 9	0 9
Coal	3 1	0 6
Dirt[a]	.. ..	2 5
Floor, smooth, hard, black shale.		
Thickness of bed	8 1	7 11
Thickness of coal sampled	7 0	4 5

[a] Not included in sample.

Section A (sample 2593) was cut 950 feet northwest from the slope, room 4, west entry 3.

Section B (sample 2594) was cut 900 feet northeast from the slope, entry 1.

Note.—The coal from this mine, like that from some other mines in the district, is friable; the dirt (shale and coal) partings are soft and are difficult to separate in mining.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests: U. S. Geol. Survey Bull. 332, p. 66; Bureau of Mines Bull. 23, pp. 58, 147; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 67; Bureau of Mines Bull. 13, pp. 105, 272; briquetting tests: U. S. Geol. Survey Bull. 332, p. 69; washing tests: U. S. Geol. Survey Bull. 332, p. 67; Bull. 336, p. 13; coking tests: U. S. Geol. Survey Bull. 332, p. 67; Bull. 336, pp. 21, 27, 36; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses, see part I of this bulletin, p. 52; also U. S. Geol. Survey Bull. 332, p. 66.

For geologic relations of bed, see U. S. Geol. Survey Bull. 326, p. 60.

MONTREAL. NO. 5 MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3152 (p. 53).

Mine.—No. 5; Greenwood-Huntington district; in sec. 18, T. 5 N., R. 32 W., near Montreal.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age; Spadra shale. Average thickness, 3 feet 4 inches.

The bed was sampled in 1906 by C. D. Smith from one of the lowest entries in the slope, and included 3 feet 4 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 49.

MONTREAL. CHEROKEE NO. 6 MINE.

Sample.—Semibituminous coal; Arkansas field; analyses Nos. 1052, 1054 (p. 53).

Mine.—Cherokee No. 6; in sec. 13, T. 5 N , R. 32 W., near Montreal.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age; Spadra shale. The coal is without partings. The bed is from 2 feet 8 inches to 2 feet 9 inches thick.

The bed was measured and sampled.

Sample 1052 included a 34-inch cut.

Sample 1054 included a 33-inch cut.

For chemical analyses see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 326, p. 96.

For geologic relations see U. S. Geol. Survey Bull. 326, p. 49.

MONTREAL. BRANNER MINE.

Sample.—Semibituminous coal; Arkansas field; analysis No. 3150 (p. 53).

Mine.—Branner; Greenwood-Huntington district; a short distance southeast of Montreal in sec. 19, T. 5 N., R. 31 W., on the St. Louis & San Francisco Railroad.

Coal bed.—Hartshorne. Carboniferous (Allegheny) age; Spadra shale. Roof, shale; the sandstone lens which constitutes the roof in the Denman and Dallas mines thins out and disappears before reaching this mine. The coal averages about 42 inches thick without partings. It has a shale roof and a shale and bone floor.

The mine was sampled in 1906 by C. D. Smith; the sample represented 3 feet 6 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 316, p. 158; Bull. 326, p. 96.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 326, p. 56.

CALIFORNIA.

ALAMEDA COUNTY.

TESLA. TESLA MINE.

Sample.—Subbituminous coal, or "black lignite;" Corral Hollow field; (California No. 1) analyses Nos. 1606, 1607 (p. 53).

Mine.—Tesla; at Tesla, on the Alameda & San Joaquin Railroad.

Coal bed.—Known locally as the Eureka or Summit. Tertiary (Eocene) age; Tejon (?) formation. The bed lies in a small synclinal basin. Thickness fairly regular.

Two samples (1606 and 1607) were collected by E. W. Parker, at widely separated points in the mine, in 1905.

Notes.—At the time the samples were collected, the mines at Tesla were noteworthy for being the only coal mines that had been worked on a considerable scale in California. The coal was rather friable and slacked. It had long been shipped to San Francisco and other California cities and had been used for domestic purposes and by railroads and factories for making steam.

For results of tests of this coal, see mention of specific tests as follows: Producer-gas tests: U. S. Geol. Survey Bull. 290, p. 53; Bureau of Mines Bull. 13, pp. 107, 272.

For chemical analyses of this coal see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 290, p. 53.

For geologic relations see 22d Ann. Rept. U. S. Geol. Survey, pt. 3, p. 501.

CONTRA COSTA COUNTY.

LOS MEDANOS. BLACK DIAMOND MINE.

Sample.—Subbituminous coal; Mt. Diablo field; analysis No. 2463 (p. 53).

Mine.—Black Diamond (now not worked); a shaft mine near Los Medanos (Black Diamond post office), on the Atchison, Topeka & Santa Fe and Southern Pacific Railroads.

Coal bed.—No name. Tertiary age, Chico (?) formation. Thickness, uniform; dip, about 15° N.

The bed was measured and sampled at a place about 1,500 feet from the foot of the shaft by M. R. Campbell, on October 31, 1905, as described below:

Section of coal bed in Black Diamond mine near Los Medanos.

Laboratory No.	2463	
	Ft.	*in.*
Coal	1	..
Bone [a]	0	1
Coal	1	7
Thickness of bed	2	8
Thickness of coal sampled	2	7

[a] Not included in sample.

Notes.—At time of sampling, this mine was operated to supply coal to a briquetting plant at Los Medanos. This plant was subsequently burned and the mine was closed.

For chemical analyses of this coal see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 290, p. 53.

For geologic relations see 22d Ann. Rept. U. S. Geol. Survey, pt. 3, p. 500.

MONTEREY COUNTY.

STONE CANYON. STONE CANYON MINE.

Sample.—Bituminous coal; Stone Canyon field; analyses Nos. 3772, 3773 (p. 53).

Mine.—Stone Canyon; a drift and inclined shaft mine in sec. 14, T. 22 S., R. 13 E., in Stone Canyon, 26 miles from San Miguel.

Coal bed.—No name. Tertiary age, Chico (?) formation, quality of coal uniform throughout bed. Thickness, uniform throughout a limited area; dip, 63° to nearly vertical.

The bed was measured and sampled at two places by M. R. Campbell on September 10, 1906, as shown below:

Sections of coal bed in Stone Canyon mine, 26 miles from San Miguel.

Section	A		B	
Laboratory No	3772		3773	
	Ft.	*in.*	*Ft.*	*in.*
Coal	5	3	12	8
Coal [a]	10	9	6	1
Thickness of bed	16	0	18	9
Thickness of coal sampled	5	3	12	8

[a] Not included in sample.

Section A (sample 3772) was measured on 300-foot level in the shaft mine and 1,600 feet east of the foot of the shaft.

Section B (sample 3773) was measured 2,000 feet in drift opening at a place 1,400 feet east of the point where sample 3772 was taken.

Notes.—Since this mine was sampled a spur 26 miles long from the Southern Pacific Railway has been built and a great deal of money spent in shipping this coal to San Francisco and in developing a market for it as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 53; also U. S. Geol. Survey Bull. 316, p. 437.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 223.

SAN BENITO COUNTY.

HERNANDEZ. TRAFTON MINE.

Sample.—Bituminous (?) coal; analysis No. 7914 (p. 53).

Mine.—Trafton; a slope mine in the NW. ¼ NW. ¼ sec. 21, T. 17 S., R. 10 E., about 8½ miles northwest of Hernandez. No railroad connections.

Coal bed.—Trafton. Tertiary age; thickness, uniform; dip, about 40° NW.

The bed was measured and sampled at a place 75 feet down the main slope by M. R. Campbell on June 4, 1909, as shown below:

Section of coal bed in Trafton mine, 8½ miles northwest of Hernandez.

Laboratory No	7914	
	Ft.	*in.*
Coal	0	8
Bone [a]	0	3
Coal	4	3
Thickness of bed	5	2
Thickness of coal sampled	4	11

[a] Excluded from sample.

Note.—The mine was not operated on a commercial scale when the sample was taken.

For chemical analyses of this coal see part I of this bulletin, p. 53.

COLORADO.

ADAMS COUNTY.

LAFAYETTE. PARKDALE MINE.

Sample.—Subbituminous coal; Denver region; analyses Nos. 6832, 6833, 6834 (p. 54).

Mine.—Parkdale, in sec. 6, T. 1 S., R. 68 W., about 2½ miles east of Lafayette.

Coal bed.—Main. Cretaceous age, Laramie formation. Thickness about 13 feet 2 inches.

The bed was sampled and measured by G. C. Martin in 1908 as described below:

Sections of coal bed in Parkdale mine, 2½ miles east of Lafayette.

Laboratory No.	6832		6833		6834	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a] 4	10	[a] 3	6	[a] 8	10
Coal	4	0	5	4	..	..
Bone and shale	[a] 0	8	[a] 0	8	[a] 0	8
Coal	[a] 3	8	[a] 3	8	3	8
Thickness of bed	13	2	13	2	13	2
Thickness of coal sampled	4	0	5	4	3	8

[a] Not included in sample.

When the samples were taken they were dry and fresh.

Sample 6832 was taken 200 feet east of foot of slope, close to fault, at 260-foot level. This was a special sample taken to show effect of fault movement.

Sample 6833 was taken 150 feet west of foot of slope, at 260-foot level, upper bench.

Sample 6834 was taken 150 feet west of slope at 260-foot level, lower bench.

For chemical analyses of this coal see part I of this bulletin, p. 54; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

ARCHULETA COUNTY.

PAGOSA SPRINGS. KLECKNER MINE.

Sample.—Bituminous coal; Pagosa Springs field; analysis No. 4175 (p. 54).

Mine.—Kleckner; in NE. ¼ sec. 36, T. 36 N., R. 1 W., 12 miles northeast of Pagosa Springs. No railroad connections.

Coal bed.—No name. Cretaceous age, Laramie formation.

The coal bed was measured and sampled for Joseph A. Taff by J. E. Chapson on October 30, 1906. The sample represented 5 feet 6 inches of coal.

Note.—The coal in 1906 was used only for ranch purposes.

For chemical analyses of this coal see part I of this bulletin, p. 54; also U. S. Geol. Survey Bull. 341, p. 363.

For geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 361.

BOULDER COUNTY.

LAFAYETTE. RANKIN MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6840 (p. 54).

Mine.—Rankin; in sec. 1, T. 1 S., R. 69 W., 1 mile southeast of Lafayette.

Coal bed.—Bed not named. Cretaceous age, Laramie formation. Thickness, 14 feet, with two partings.

The bed was measured and sampled by G. C. Martin in 1908, as shown below:

Section of coal bed in Rankin mine, 1 mile southeast of Lafayette.

Laboratory No.	6840	
	Ft.	*in.*
Coal	6	1
Bone and shale [a]	4	0
Coal [a]	2	11
Shale [a]	0	4
Coal [a]	1	0
Thickness of bed	14	4
Thickness of coal sampled	6	1

[a] Not included in sample.

The sample was taken 200 feet north and 200 feet east of foot of shaft.

For chemical analyses of this coal see part I of this bulletin, p. 54; also U. S. Geol. Survey Bull. 381, p. 302.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 381, p. 297.

LAFAYETTE. SIMPSON MINE.

Sample.—Subbituminous coal; Denver region; (Denver No. 26) analyses Nos. 792–D, 793–D, and (Colorado No. 1) analyses Nos. 1383, 1397 (pp. 54, 55).

Mine.—Simpson; Northern district; a shaft mine at Lafayette, on the Chicago, Burlington & Quincy Railroad and the Colorado & Southern Railway.

Coal bed.—Lower. The coal is of Cretaceous age, Laramie formation. The thickness is fairly uniform; dip varies, but is nearly flat. The shaft is 240 feet deep. The coal is black and lustrous with a structure approaching block coal. Floor, bastard fire clay.

The bed was measured and sampled at two points by Frank W. DeWolf in 1904, as described below:

Sample 1397 was taken in room 5 off northwest entry 4, and represented 11 feet of clean coal.

Sample 1383 was taken in room 23 off southwest entry 23, and represented 14 feet of clean coal.

The bed was also measured and sampled at two other points as described below:

Sections of coal bed in Simpson mine at Lafayette.

Section	A		B	
Laboratory No.	792–D		793–D	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	11½	4	2
Mother coal and sulphur	0	¼	..	..
Bone coal	..	...	0	1½
Coal	0	7½	..	..
Mother coal and sulphur	0	¼	..	..
Coal	3	5	2	9
Floor, bastard fire clay.				
Thickness of bed	7	½	7	½
Thickness of coal sampled	7	½	7	½

Section A (sample 792–D) was measured 1,500 feet southwest of the shaft, in room 9, off entry 87.

Section B (sample 793–D) was measured 3,000 feet west of the shaft, in room 6, off entry 69.

Notes.—Like other coals of the same character, the coal slacks easily on exposure to the atmosphere, and relatively little was mined during the summer. In the winter the maximum daily output in 1904 was about 1,400 tons. Most of the coal shipped was used for steam purposes in the vicinity of Denver, and for locomotive fuel; a small percentage was sold for domestic use.

For results of tests of this coal, see mention of specific tests as follows—Steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 423; Bull. 261, p. 80; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1031; Bull. 261, p. 90; Bureau of Mines Bull. 13, pp. 108, 272; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1436; Bull. 261, p. 152; washing tests: U. S. Geol. Survey, coking tests: Bureau of Mines Bull. 5, pp. 21, 51.

For chemical analyses see part I of this bulletin, pp. 54, 55; also U. S. Geol. Survey Prof. Paper 48, p. 204; Bull. 261, p. 35.

LOUISVILLE. ACME MINE.

Sample.—Subbituminous coal; Denver region; analyses Nos. 6837, 6838, 6839 (p. 55).

Mine.—Acme; in sec. 8, T. 1 S., R. 69 W., near Louisville.

Coal bed.—The bed is of Cretaceous age, Laramie formation.

Thickness, 6 feet 8 inches to 10 feet 1 inch.

The bed was measured and sampled by G. C. Martin in 1908, as indicated below:

Sections of coal bed in Acme mine, near Louisville.

Laboratory No.	6837		6838		6839	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a]5	2	3	8	[a]1	10
Shale	[a]0	4	..	..	[a]0	4
Coal	1	8	..	..	3	4
Parting	..	..	0	¼	..	..
Coal	2	11	3	0	[a]1	8
Coal	..	..	..	..	[a]2	11
Thickness of bed sampled	10	1	6	8¼	10	1
Thickness of coal sampled	4	7	6	8¼	3	4

[a] Not included in sample.

The samples were dry when taken.

Samples 6837 and 6839 were taken at points 800 feet south and 950 feet east of foot of shaft and 185 and 180 feet below surface, respectively.

Sample 6838 was taken at a point 900 feet north and 400 feet east of foot of shaft (north of fault) and 200 feet below surface.

For chemical analyses of this coal see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 381, pp. 301, 302.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 381, p. 297.

MARSHALL. MITCHELL-MONARCH MINE.

Sample.—Subbituminous coal; Denver Basin field; analysis No. 6835 (p. 55).

Mine.—Mitchell-Monarch; in sec. 14, T. 1 S., R. 70 W., northwest of Marshall.

Coal bed.—Main. Cretaceous age, Laramie formation. Thickness, 6 feet 3 inches.

The bed was measured and sampled by G. C. Martin, in 1908, as described below:

Section of coal bed in Mitchell-Monarch mine, northwest of Marshall.

Laboratory No.	6835	
	Ft.	*in.*
Coal	6	0
Coal [a]	0	3
Thickness of bed	6	3
Thickness of coal sampled	6	0

[a] Not included in sample.

The sample was taken 75 feet north and 350 feet east of foot of shaft, 235-foot level. It was dry and fresh when taken.

For chemical analyses see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

SUPERIOR. INDUSTRIAL MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6836 (p. 55).

Mine.—Industrial, in sec. 24, T. 1 S., R. 70 W., at Superior.

Coal bed.—No name. Cretaceous age, Laramie formation. Thickness, 7 feet.

The bed was measured and sampled by G. C. Martin in 1908, the sample representing 7 feet of coal.

The sample was taken 1,250 feet east and 450 feet south of foot of shaft. When taken, it was dry and fresh.

For chemical analyses of this coal see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 297.

DELTA COUNTY.

BOWIE. KING MINE.

Sample.—Bituminous coal; Grand Mesa field; (Denver No. 14) analyses Nos. 378–D, 379–D and 5531, 5532, 5533 (p. 55).

Mine.—King; Somerset district; a drift mine in the NE. ¼ NE. ¼ sec. 15, T. 13 S., R. 91 W., at Bowie, on the Denver & Rio Grande Railroad.

Coal bed.—Known as Juanita. The bed is of Cretaceous age; it is about 50 feet above the base of the Bowie member of the Mesaverde formation. Thickness, regular; bed nearly horizontal, dipping 7°. Roof, shale, a few inches thick, overlain with sandstone; in mining only 7 to 8 feet of coal is taken, leaving a coal roof; floor 3 or 4 inches of shale, underlain with sandstone.

The bed was measured and sampled by J. W. Groves in 1908, as described below:

Section A (sample 379–D) was measured in the main slope, 1,070 feet northwest of the main opening. The sample included 6 feet 5 inches of coal.

Section B (sample 378–D) was measured in room 1, in west butt entry, 900 feet northwest of the main opening. The sample included 6 feet 10 inches of coal.

The bed was also measured and sampled at two points by W. T. Lee, on August 28, 1907, as described below:

Sections of coal bed in the King mine at Bowie.

Laboratory No	5533		5531	
	Ft.	*in.*	*Ft.*	*in.*
Roof, carbonaceous shale.				
Coal	1	2	[a] 1	2
Shale	[a] 0	3	[a] 0	3
Coal	3	7	[a] 3	7
Coal "sulphur streak"	[a] 0	4	[a] 0	4
Coal	6	8	6	8
Shale, carbonaceous	[a] 0	8	[a] 0	8
Floor, shale:				
Thickness of bed	12	8	6	8
Thickness of coal sampled	4	9	6	8

[a] Not included in sample.

Sample 5533 was collected from a working face 700 feet from the mouth of the mine and included the upper two benches. The 3-inch shale parting is soft, crumbles easily, and probably some of the shale was included in the sample.

Sample 5531 was taken at the same point at which sample 5533 was taken, but included an 80-inch cut from the lower bench.

The bed was also measured and sampled at another point. The sample (No. 5532) was taken 500 feet from the mouth of the mine (lower bench) and represented a 6⅓-foot cut of "dead" coal.

Notes.—The coal is clean, bright, and of coking quality, and at the time of sampling (1907) was used principally for steam and domestic purposes. The output then was about 100 tons per day.

For results of tests of this coal see mention of specific tests as follows: Washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 368, p. 48.

For chemical analyses see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 368, p. 24; Bull. 341, p. 333; Bureau of Mines Bull. 5, p. 20.

For geologic relations see U. S. Geol. Survey Bull. 341, pp. 319–332.

BOWIE. OLD KING MINE.

Sample.—Bituminous coal: Grand Mesa field; analysis No. 5760 (p. 55).

Mine.—Old King; an abandoned drift mine in the Somerset district in the NE. ¼ NW. ¼ sec. 15, T. 13 S., R. 91 W., ½ mile northwest of Bowie.

Coal bed.—Not named. Cretaceous age, base of the Bowie member of the Mesaverde formation. Thickness, regular; bed lies nearly horizontal; roof, shale; floor, massive sandstone.

The bed was measured and sampled by W. T. Lee on August 27, 1907, as described below:

Section of coal bed in Old King mine at Bowie.

Laboratory No	5760	
Roof, shale.	*Ft.*	*in.*
Coal	4	0
Bony coal [a]	0	4
Floor, massive sandstone.		
Thickness of bed	4	4
Thickness of coal sampled	4	0

[a] Not included in sample.

Notes.—The sample was collected from a fresh face, 700 feet from the mouth of the opening. The coal was hard like most of that mined in the Somerset district and is not known to coke. It was formerly used for making steam and for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

BOWIE. COOPERATIVE MINE.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5527 (p. 55).

Mine.—Cooperative; Somerset district; a drift mine in the SW. ¼ SW. ¼ sec. 17, T. 13 S., R. 91 W., 3 miles southwest of Bowie and about 3 miles north of Paonia.

Coal bed.—Not named. Cretaceous age. Bed is about 175 feet above the base of the Bowie member of the Mesaverde formation. Thickness, regular; bed nearly horizontal; roof, sandstone; floor, shale.

The bed was measured and sampled by W. T. Lee on August 21, 1907, as described below:

Section of coal bed in Cooperative mine, 3 miles southwest of Bowie.

Laboratory No	5527	
Roof, sandstone.	*Ft.*	*in.*
Coal bony [a]	2	0
Coal	8	8
Shale carbonaceous [a]	0	6
Floor, shale.		
Thickness of bed	11	2
Thickness of coal sampled	8	8

[a] Not included in sample.

The sample was collected from a working face, 300 feet from the mouth of the opening.

Notes.—This coal, like most of that mined in the Somerset district, is relatively hard and did not slack on exposure to the weather. It did not coke. In 1907 the output was used wholly as domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 55; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319, 332.

CEDAREDGE. MCGRUDER MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5524 (p. 56).

Mine.—McGruder; Rollins district: a drift mine in the SW. ¼ NE. ¼ sec. 15, T. 13 S., R. 94 W., in the south slope of Grand Mesa about 2 miles northeast of Cedaredge.

Coal bed.—Not named; Cretaceous age; bed is at the base of the Paonia member of the Mesaverde formation. Roof, shale; floor, sandstone.

The bed was measured and sampled by C. S. Blair on August 6, 1907, as described below:

Section of coal bed in McGruder mine, 2 miles northeast of Cedaredge.

Laboratory No	5524	
Roof, shale.	*Ft.*	*in.*
Coal	3	6
Shale [a]	3	0
Coal [a]	3	0
Floor, sandstone.		
Thickness of bed	9	6
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was collected from a freshly cleared face 250 feet from the mouth of the opening and represents only the upper bench of coal.

Notes.—The coal is soft and slacks on exposure to the weather. It is not a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 341, pp. 319–332.

CEDAREDGE. WARD MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5538 (p. 56).

Mine.—Ward, Rollins district; a drift mine, in the south slope of Grand Mesa, in the NE. ¼ SE. ¼ sec. 12, T. 13 S., R. 94 W., 4½ miles northeast of Cedaredge.

Coal bed.—Not named. Cretaceous age; at the base of the Paonia member of the Mesaverde formation.

The bed was measured by C. S. Blair on August 17, 1907, as described below:

Section of coal bed in Ward Mine, 4½ miles northeast of Cedaredge.

Laboratory No	5538	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal	5	4
Shale, carbonaceous [a]	3	0
Thickness of bed	8	4
Thickness of coal sampled	5	4

[a] Not included in sample.

The sample was collected from a freshly cleared face 200 feet from the mouth of the opening.

Notes.—Like most of the coals in the Rollins district this coal is soft and slacks readily on exposure to the weather. It does not coke.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

CEDAREDGE. BENNETT MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5525 (p. 56).

Mine.—Bennett, Rollins district; a drift mine; in the south slope of Grand Mesa, in the SW. ¼ NW. ¼ sec. 23, T. 13 S., R. 93 W., 8½ miles east of Cedaredge and about 8 miles north of Hotchkiss.

Coal bed.—Not named. Cretaceous age, second bed above the base of the Mesaverde formation. Thickness regular; bed lies horizontal; roof, shale; floor, shale.

The bed was measured and sampled by W. T. Lee on August 14, 1907, as described below. The sample represented 5 feet 6 inches of coal, the thickness of the bed at the point of sampling.

The sample was collected from a working face 50 feet from the mouth of the mine. and represents the thickness of the bed.

Notes.—The coal is soft and slacks on exposure to the weather. It does not coke, and in 1907 was used principally as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

CEDAREDGE. NEWMAN MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5537 (p. 56).

Mine.—Newman, Rollins district; a drift mine in the west face of Oak Mesa, SE. ¼ NW. ¼, sec. 26, T. 13 S., R. 93 W, 9 miles east of Cedaredge and about 4 miles north of Hotchkiss.

Coal bed.—Not named; Cretaceous age, Paonia member of the Mesaverde formation. Thickness, regular; bed, nearly horizontal; roof and floor, shale.

The bed was measured and sampled by W. T. Lee on August 15, 1907, the sample representing 14 feet of coal, the thickness of the bed.

The sample was collected from a working face 240 feet from the mouth of the mine.

Notes.—The coal is clean and bright, but like most of the coal in the Rollins district it is soft and slacks on exposure to the weather. It does not coke, and in 1907 was used principally as domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–335.

HOTCHKISS. BURDICK MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5536 (p. 56).

Mine.—Burdick, a drift mine, Rollins district; in the SE. ¼ SW. ¼ sec. 30, T. 13 S., R. 92 W., in the south slope of Oak Mesa, about 6 miles north of Hotchkiss.

Coal bed.—Not named. Cretaceous age; lowest bed in the Mesaverde formation. Thickness, uniform; bed is nearly horizontal; neither the roof or floor was exposed in the mine.

The bed was measured and sampled by W. T. Lee on August 16, 1907.

The sample represented a thickness of 6 feet 2 inches of wet coal and was collected from a working face 800 feet from the mouth of the opening.

Notes.—The coal is slightly harder than most of the coals from the Rollins district, but like them, slacks on exposure to the weather. It does not coke, and in 1907 when the sample was taken it was used principally as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–335.

HOTCHKISS. STUCKER MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5552 (p. 56).

Mine.—Stucker; Rollins district, in the SE. ¼ NE. ¼ sec. 21, T. 13 S., R. 92 W., in Road Cap Canon, 8 miles northeast of Hotchkiss and about 4 miles northwest of Paonia.

Coal bed.—Not named. Cretaceous age; lies about 50 feet above the base of the Mesaverde formation.

The bed was measured and sampled by C. S. Blair, August 17, 1907, as described below:

Section of coal bed in Stucker mine, 8 miles northeast of Hotchkiss.

Laboratory No.	5552	
	Ft.	*in.*
Roof, shale.		
Coal [a]	2	6
Shale [a]	0	6
Coal	10	0
Floor, sandstone.		
Thickness of bed	13	0
Thickness of coal sampled [b]	6	6

[a] Not included in sample. [b] Lower part of 10-foot bench.

The sample was collected from a weathered face in an open prospect.

Notes.—The coal has here been hardened by burning and the upper part of the bed was burned away in some places.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

PAONIA. CONINE MINE.

Sample.—Bituminous coal; Grand Mesa field; analyses Nos. 5526, 5551 (p. 56).

Mine.—Conine; Somerset district; a drift mine in the NW. ¼ SE. ¼ sec. 24, T. 13 S., R. 92 W., 9 miles northeast of Hotchkiss and 3 miles northwest of Paonia.

Coal bed.—Not named. Cretaceous age; lowest bed in the Bowie member of the Mesaverde formation. Thickness, regular; bed lies nearly horizontal; roof, shale; floor, shale, below which is massive sandstone.

The bed was measured and sampled by W. T. Lee on August 20, 1907, as described below:

Section of coal bed in the Conine mine, 3 miles northwest of Paonia.

Laboratory No.	5551		5526	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	7	8	[a]7	8
Shale	[a]1	6	[a]1	6
Coal	[a]6	6	6	6
Shale	[a]2	0	[a]2	0
Floor shale.				
Thickness of bed	17	8	17	8
Thickness of coal sampled	7	8	6	6

[a] Not included in sample.

The samples were collected from working faces, 300 feet from the mouth of the mine.

Notes.—The coal is harder than most of the coals in the Rollins district farther to the west, and like all of the coals developed in the Somerset district it does not slack readily on exposure to the weather. The coal does not coke and at time of sampling was used principally as a domestic fuel.

For chemical analyses of this coal, see Part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 341, pp. 319–332.

Rollins. Rollins Mine.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5542 (p. 56).

Mine.—Rollins; Rollins district; a drift mine in the NW. ¼ NW. ¼ sec. 35, T. 13 S., R. 96 W., at Rollins, 10 miles north of the town of Delta. The mine is situated in the south slope of Grand Mesa at an altitude of 7,700 feet or 3,000 feet above the town.

Coal bed.—Not named. Cretaceous age; lies at the base of the Paonia member of the Mesaverde formation. Thickness, 7 to 16 feet (in the Rollins mine it is more uniform); roof, carbonaceous shale which tends to fall with the coal; floor, black fissile shale which separates readily from the coal; cover, several hundred feet thick.

The bed was measured and sampled by W. T. Lee, on July 17, 1907, as described below:

Section of coal bed in the Rollins mine, at Rollins.

Laboratory No.	5542	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal [a]	3	0
Shale [a]	2	0
Coal	11	0
Floor, black fissile shale.		
Thickness of bed	16	0
Thickness of coal sampled	11	0

[a] Not included in sample.

The sample was collected from a working face in the main workings of the mine, 285 feet in, and included 11 feet of solid coal of the lower bench, the upper 3-foot bench not being exposed at the place where the sample was taken.

Notes.—The coal from this mine, like that from nearly all of the mines in this district, is soft and friable and slacks readily on exposure to the weather. It is used for heating and power purposes and is not a coking coal. In 1907 the mine was worked irregularly.

For chemical analyses of this coal, see Part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 341, pp. 319–332.

Rollins. Kuhnley Mine.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5541 (p. 56).

Mine.—Kuhnley; Rollins district; a drift mine, in the SE. ¼ SE. ¼ sec. 34, T. 13 S., R. 96 W., 1 mile southwest of Rollins. It is at an altitude of 7,900 feet, or 3,000 feet above the town of Delta.

Coal bed.—Not named. Cretaceous age; at the base of the Paonia member of the Mesaverde formation. Thickness, about 7 to 16 feet; dip, slight, toward the north. Roof, shale, above which is an upper bench of coal 5 to 6 feet thick; floor, shale; cover, 100 to 200 feet thick.

The bed was measured and sampled by W. T. Lee, on July 18, 1907. The sample represented 7 feet 6 inches of coal, the thickness of the bed at the point of sampling.

The sample was collected from a freshly cleared face in the main entry, 2,000 feet from the mouth of the opening.

Notes.—The coal from this mine, like that from nearly all the mines in this district, is soft and friable and slacks readily on exposure to the weather. In 1907 the mine was operated only during the winter months and the coal was used entirely as domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

ROLLINS. FAIRVIEW MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5540 (p. 56).

Mine.—Fairview, a drift mine, Rollins district; in the south slope of Grand Mesa, in the SW. ¼ NE. ¼ sec. 19, T. 13 S., R. 95 W., 3 miles northeast of Rollins and 12 miles north of Delta.

Coal bed.—Not named. Cretaceous age; at this locality the bed is 33 feet above the base of the Paonia member of the Mesaverde formation. Thickness, uniform; bed nearly horizontal; roof, shale, above which is sandstone; main floor, sandstone.

The bed was measured and sampled by W. T. Lee on July 25, 1907, as described below:

Section of coal bed in the Fairview mine, 3 miles northeast of Rollins.

Laboratory No.	5540	
	Ft.	*in.*
Roof, shale.		
Coal	6	6
Coal bony [a]	4	0
Floor, sandstone.		
Thickness of bed	10	6
Thickness of coal sampled	6	5

[a] Not included in sample.

The sample was collected from the working face, 800 feet from the mouth of the main entry.

Notes.—The coal is soft and slacks readily on exposure to the weather. In 1907 it was used principally as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 56; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

ROLLINS. WINTON MINE (UPPER BENCH).

Sample.—Subbituminous(?) coal; Grand Mesa field; analyses Nos. 5522, 5539 (p. 57).

Mine.—Winton; Rollins district, in the south slope of Grand Mesa; a drift mine, in the SE. ¼ NW. ¼ sec. 16, T. 13 S., R. 95 W., 5 miles northeast of Rollins, 5 miles northwest of Cedaredge, and about 14 miles northeast of Delta.

Coal bed.—Not named. Cretaceous age; the lowest coal in the Paonia member of the Mesaverde formation. Thickness, irregular; bed lies horizontal; roof, shale; floor, mainly sandstone.

The bed was measured and sampled at two points by W. T. Lee on July 31, 1907.

Sample 5522 included a 4-foot cut of coal from the upper bench of the 11-foot coal bed.

Sample 5539 included a 5-foot cut from the lower 7-foot bench.

The samples were collected from a working face, 500 feet from the mouth of the mine.

Notes.—The coal is soft and weathers readily on exposure to the atmosphere. In 1907 it was used mainly as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

ROLLINS. WATSON MINE.

Sample.—Subbituminous(?) coal; Grand Mesa field; analysis No. 5521 (p. 57).

Mine.—Watson, Rollins district; a drift mine on the south slope of Grand Mesa in the SW. ¼ SE. ¼ sec. 11, T. 13 S., R. 95 W., 7 miles northeast of Rollins and about 4 miles northwest of Cedaredge.

Coal bed.—Not named. Cretaceous age; about 100 feet above the base of the Paonia member of the Mesaverde formation. Thickness, uniform; lies nearly horizontal; roof, shale; floor, shale.

The bed was measured and sampled by W. T. Lee on August 1, 1907, as described below:

Section of coal bed in the Watson mine, 7 miles northeast of Rollins.

Laboratory No.	5521	
	Ft.	*in.*
Roof, shale.		
Coal	3	6
Shale [a]	0	8
Coal [a]	1	6
Floor, shale.		
Thickness of bed	5	8
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was collected from a working face, 200 feet from the mouth of the mine.

Notes.—The coal is harder than most of the coal of the Rollins district and does not coke. In 1907 it was used principally as a domestic fuel. The lower bench is harder than the upper bench and the coal was used for blacksmith purposes.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

ROLLINS. STATES MINE.

Sample.—Subbituminous coal; Grand Mesa field; analysis No. 5523 (p. 57).

Mine.—States; Rollins district, a drift mine in the south slope of Grand Mesa, in the NW. ¼ NE. ¼ sec. 13, T. 13 S., R. 95 W., 8½ miles northeast of Rollins and about 2 miles northwest of Cedaredge.

Coal bed.—Not named. Cretaceous age; at the base of the Paonia member of the Mesaverde formation. Roof, soft shale which tends to fall with the coal; floor, shale.

The bed was measured by W. T. Lee on August 4, 1907, as described below:

Section of coal bed in States mine, 8½ miles northeast of Rollins.

Laboratory No.	5523	
	Ft.	*in.*
Roof, shale.		
Coal [a]	3	0
Shale [a]	1	0
Coal	7	0
Floor, shale.		
Thickness of bed	11	0
Thickness of coal sampled [b]	6	5

[a] Not included in sample.

[b] Upper part of 7-foot bench.

This sample (5523) was collected from a working face 110 feet from the mouth of the opening and included the upper 6 feet 5 inches of the lower bench. In sampling, the lower part of this bench was rejected because of water standing in the mine. The upper 3-foot bench was not worked.

Notes.—The coal is soft and slacks readily on exposure to the weather, like most of the coals of this district. It is not a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

WELLS GULCH. ABANDONED DRIFT MINE.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5534 (p. 57).

Mine.—Abandoned drift; Gunnison district; in Wells Gulch, in sec. 18, T. 4 S., R. 3 E., on the Denver & Rio Grande Railroad, 12 miles northwest of Delta.

Coal bed.—Not named. Cretaceous age, at the base of the Mancos shale. Thickness, variable, 1 to 4 feet; dip, slightly northeast; roof, sandstone; floor, shale. The coal is under cover of 50 to 100 feet.

The coal was measured and sampled by W. T. Lee on July 11, 1907, the sample representing 1 foot 6 inches of coal, the thickness of the bed at the point of sampling.

The sample was collected from a freshly cleared face of weathered coal in the main entry, 160 feet from the mouth of the opening.

Notes.—The coal is hard and does not weather readily. No coal had been shipped from this mine at the time of sampling and it was used locally for domestic purposes and for blacksmithing.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

EL PASO COUNTY.

CALHAN. PURDON PROSPECT.

Sample.—Subbituminous coal, Colorado Springs field; analysis No. 7128 (p. 57).

Location.—Purdon prospect, in SE. ¼, NW. ¼, sec. 27, T. 11 S., R. 61 W., 6 miles northeast of Calhan.

Coal bed.—Not named; Cretaceous age; Laramie formation. Thickness, 1 foot 9½ inches.

The bed was measured by M. I. Goldman in 1908; it showed 1 foot 9½ inches of coal at the point of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 338.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

COLORADO SPRINGS. KEYSTONE MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6546 (p. 57).

Mine.—Keystone; in sec. 4, T. 14 S., R. 66 W., 3½ miles northeast of Colorado Springs.

Coal bed.—"A." Cretaceous age; Laramie formation. Thickness about 6 feet 5½ inches; roof, clay, underlain with bony coal.

The bed was measured and sampled by M. I. Goldman in 1908, as described below:

Section of coal bed in Keystone mine, 3½ miles northeast of Colorado Springs.

Laboratory No.	6546	
	Ft.	*in.*
Bone[a]	0	3
Bony coal[a]	2	6
Sandy coal[a]	0	2½
Coal	3	6
Thickness of bed	6	5½
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken in crosscut being driven as an airway to old workings, 50 feet south of main entry and 800 feet from foot of shaft.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319-335.

COLORADO SPRINGS. NEER MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6439 (p. 57).

Mine.—Neer, in sec. 13, T. 13 S., R. 67 W., 4 miles north of Colorado Springs.

Coal bed.—"A." Cretaceous age; Laramie formation. Thickness, 4 feet 7 inches; roof, sandstone.

The bed was measured and sampled by M. I. Goldman in 1908. The sample represented 4 feet 7 inches of coal, the thickness of the bed at the point of sampling.

The sample was taken in main entry, 130 feet south of foot of shaft.

For chemical analyses of the coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319-335.

COLORADO SPRINGS. PROSPECT OPENING.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 7129 (p. 57).

Location.—Prospect opening; in the SE. ¼ NE. ¼ sec. 24, T. 13 S., R. 67 W., 4 miles north of Colorado Springs.

Coal bed.—"C." Cretaceous age; Laramie formation. Thickness, 2 feet 4 inches; roof and floor, shale.

The bed was measured and sampled by M. I. Goldman in 1908. The sample represented 2 feet 4 inches of coal, the thickness of the bed at the point of sampling.

The prospect had not been operated for some time and the coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 338.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319-335.

COLORADO SPRINGS. RAPSON MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6441 (p. 57).

Mine.—Rapson; in sec. 33, T. 13 S., R. 66 W., 4 miles northeast of Colorado Springs.

Coal bed.—"A." Cretaceous age, Laramie formation. Thickness, 10 feet 3 inches, upper 1 foot 3 inches being clay; floor, bone.

The bed was measured and sampled by M. I. Goldman, as described below:

Section of coal bed in Rapson mine, 4 miles northeast of Colorado Springs.

Laboratory No.	6441	
	Ft.	*in.*
Clay[a]	1	3
Coal, bony[a]	1	0
Coal	8	0
Floor, bony coal.		
Thickness of bed	10	3
Thickness of coal sampled[b]	5	9

[a] Not included in sample.

[b] Only 5 feet 9 inches of this 8-foot bed was sampled.

The sample was taken from third room off south entry 4, and represented 5 feet 9 inches of main bench.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319-335.

CURTIS. CURTIS MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6440 (p. 57).

Mine.—Curtis; in sec. 29, T. 13 S., R. 66 W., at Curtis.

Coal bed.—"A." Cretaceous age, Laramie formation. Thickness, 17 feet 1 inch; roof and floor, clay.

The bed was measured and sampled by M. I. Goldman in 1908, as described below:

Section of coal bed in Curtis mine, at Curtis.

Laboratory No	6440	
Roof, clay.	*Ft.*	*in.*
Bone[a]	0	8
Sandy coal[a]	2	2
Bony coal[a]	1	6
Coal	12	9
Floor, clay.		
Thickness of bed	17	1
Thickness of coal sampled[b]	6	10

[a] Not included in sample.

[b] Only 6 feet 10 inches of this bench was sampled.

The sample was taken from back entry off seventh north entry and represented 6 feet 10 inches of the lower bench.

Note.—Output in 1910, 88,055 tons.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

CURTIS. DANVILLE MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6442 (p. 57).

Mine.—Danville; in sec. 29, T. 13 S., R. 66 W., near Curtis.

Coal bed.—"A." Cretaceous age, Laramie formation. Thickness, 8 feet 10 inches; roof and floor, shale.

The bed was measured and sampled by M. I. Goldman in 1908, as described below:

Section of coal bed in Danville mine near Curtis.

Laboratory No	6442	
Roof, shale.	*Ft.*	*in.*
Bony coal	1	4
Coal	4	0
Bony coal[a]	0	4
Coal	0	5
Bony coal	0	8
Coal[a]	3	4
Floor, shale.		
Thickness of bed	10	1
Thickness of coal sampled	6	5

[a] Not included in sample.

The sample was taken from main slope beyond ninth entry.

Note.—Output in 1910, 45,488 tons.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

FRANCEVILLE. CELL (NEW FRANCEVILLE) MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6438 (p. 57).

Mine.—Cell, or New Franceville; in sec. 30, T. 14 S., R. 64 W., 2 miles south of Franceville.

Coal bed.—"A". Cretaceous age, Laramie formation. Thickness, about 5 feet 3 inches; roof, shale.

The bed was measured and sampled by M. I. Goldman in 1908, as described below:

Section of coal bed in Cell, or New Franceville mine, 2 miles south of Franceville.

Laboratory No	6438	
Roof, shale.	*Ft.*	*in.*
Bony coal [a]	1	6
Coal	3	6
Bony coal [a]	0	3
Thickness of bed	5	3
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken at a point 1,050 feet northeast of mouth of slope.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 338.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

Franceville. Davies Mine.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6437 (p. 57).

Mine.—Davies; in sec. 29, T. 14 S., R. 64 W., 2½ miles southeast of Franceville.

Coal bed.—"A." Cretaceous age; Laramie formation. Thickness, 4 feet 8 inches; roof, clay; floor, clay.

The bed was measured and sampled by M. I. Goldman in 1908, as described below:

Section of coal bed in Davies mine, 2½ miles southeast of Franceville.

Laboratory No	6437	
Roof, clay.	*Ft.*	*in.*
Coal	1	1
Sandy coal [a]	1	3
Coal	2	4
Floor, clay.		
Thickness of bed	4	8
Thickness of coal sampled	3	5

[a] Not included in sample.

The sample was taken at a point 425 feet northeast of mouth of main slope.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 338.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

Pikeview. Carlton mine.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6443 (p. 57).

Mine.—Carlton; in sec. 18, T. 13 S., R. 66 W., near Pikeview.

Coal bed.—"A." Cretaceous age, Laramie formation. Thickness, 8 feet 10 inches; roof, sandstone.

The bed was measured and sampled by M. I. Goldman, as described below:

Section of coal bed in Carlton mine near Pikeview.

Laboratory No	6443	
Roof, sandstone.	*Ft.*	*in.*
Bony coal [a]	0	10
Coal	3	2
Bony coal [a]	1	0
Coal	3	8
Thickness of bed	8	8
Thickness of coal sampled	6	10

[a] Not included in sample.

The sample was taken from face of room 19 off entry 13.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

PIKEVIEW. MONUMENT VALLEY MINE.

Sample.—Subbituminous coal; Colorado Springs field; analysis No. 6545 (p. 57).

Mine.—Monument Valley; in the SW. ¼ sec. 11, T. 13 S., R. 67 W., 3 miles northwest of Pikeview.

Coal bed.—"B." Cretaceous age; Laramie formation. Thickness 2 feet 7 inches; roof, shale; floor, sandy coal.

The bed was measured and sampled by M. I. Goldman in 1908, the sample representing 2 feet 7 inches of weathered coal from 36-inch bed.

The sample was taken on south wall of slope 20 feet from mouth.

The coal was dry but probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 57; also U. S. Geol. Survey Bull. 381, p. 337.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 319–335.

FREMONT COUNTY.

CANON CITY. ROYAL GORGE NO. 2 MINE.

Sample.—Bituminous coal; Canon City field; analyses Nos. 6249, 6252, 6253 (p. 58).

Mine.—Royal Gorge No. 2; in sec. 17, T. 19 S., R. 70 W., 3 miles south of Canon City.

Coal beds.—Upper, Lower, and Middle. Cretaceous age; Vermejo formation. Thickness 4 feet 6 inches, 4 feet, and 3 feet 8 inches, respectively; roofs, sandstone; dip, 50° E.

The beds were measured and sampled in 1908 by C. W. Washburne.

Sample 6249 included 4½ feet of coal, and was taken from the Upper bed in crosscut from level No. 5.

Sample 6252 represented 4 feet of coal, and was taken from the Middle bed on level No. 6. It was wet when taken.

Sample 6253 represented 3⅔ feet of coal, and was taken from the Lower bed on level No. 6, south side of main entry. It was wet when taken.

Samples 6252 and 6253 were from two beds within 7 feet of each other, separated by fine sandstone and hard shale. Sample 6249 was from a bed about 166 feet below these.

Notes.—The relative percentages of the sizes obtained in 1908 were: Lump coal, 40 per cent; nut coal, 25 per cent; pea and slack, 35 per cent.

The combined annual output was 65,000 tons, most of which was shipped by rail.

For chemical analyses of this coal see part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 373.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

CANON CITY. NONAC (NO. 5) MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6251 (p. 58).

Mine.—Nonac (No. 5, now known as No. 39); a slope mine in sec. 5, T. 19 S., R. 70 W., 2 miles south of Canon City.

Coal bed.—Name not known. Cretaceous age, Vermejo formation. Dip at mouth of slope 23° SE., but decreases to 12° within a short distance. This bed is about 70 feet above the Rockvale bed, and varies in thickness from 5 feet 8 inches to 6 feet 2 inches, except along northern margin of workings, where the coal is only 4 feet thick, with a parting 10 to 12 inches thick. This parting wedges out a quarter of a mile to the south and is represented by only ½ inch of shale.

The bed was measured and sampled by C. W. Washburne in 1908. The sample represented 6 feet of coal.

The sample was taken from working face of mine 2,600 feet east of mouth of mine. The sample was wet.

Notes.—The mine, when sampled in 1908, was equipped with stationary screens. The coal is comparatively hard and stocks well. The product was made up of lump coal, 55 per cent; nut coal, 20 per cent; pea and slack, 25 per cent. The output before the mine closed in 1907 was about 300 tons a day. The mine was kept in readiness for reopening at the time it was visited.

For chemical analyses of this coal see Part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 373.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

CANON CITY. DIAMOND MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6250 (p. 58).

Mine.—Diamond; a small inclined shaft 240 feet deep, ¼ mile east of southwest corner of sec. 17, T. 19 S., R. 70 W., about 4 miles south of Canon City.

Coal bed.—No name. Cretaceous age, Vermejo formation. Dip, 75° E. in upper 100 feet of shaft, and about 55° E. in the lower 140 feet; thickness, about 3 feet to 3 feet 6 inches; roof, shale.

The bed was measured by C. W. Washburne in 1908, as described below:

Section of coal bed in Diamond mine, 4 miles south of Canon City.

Laboratory No	6250	
Roof, shale.	*Ft.*	*in.*
Coal	1	2
Shale	0	¼
Coal	2	2
Thickness of bed	3	4¼
Thickness of coal sampled	3	4¼

The sample was taken from level No. 2.

Notes.—Coal is hard, but is crushed in some places in mine. Bed is much jointed. Average production of mine in November and December, 1908, reported as 75 tons a month.

For chemical analyses of this coal see Part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 373.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

CANON CITY. LITTELL MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6257 (p. 58).

Mine.—Littell; a shaft mine, in Wolf Park, in sec. 16, T. 19 S., R. 70 W., 3 miles southeast of Canon City.

Coal bed.—Upper (Brookside?). Cretaceous age, Vermejo formation. Thickness, about 2 feet. When the mine was visited the shaft was 1,065 feet deep. Roof, shale; floor, clay underlain by sandstone.

The bed, measured and sampled by C. W. Washburne in 1908, showed 2 feet of coal.

The sample was taken 100 feet south of shaft, in entry 1 south, at a depth of 950 feet. It was wet when taken.

No samples were collected from the main (Chandler) bed at the bottom, but the sample mentioned above was from the upper bed (or Brookside?), about 99 feet above it.

Notes.—The bed sampled had been explored by prospects drifts when the mine was visited. At that time production from the main bed was curtailed.

For chemical analyses of this coal see Part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 373.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

CHANDLER. CHANDLER MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6254 (p. 58).

Mine.—Chandler; near southeast corner of sec. 22, T. 19 S., R. 70 W., in Chandler.

Coal bed.—Chandler(?). Bed lies from 75 to 100 feet below Brookside bed. Cretaceous age, Vermejo formation. Thickness, 4 feet 11 inches to 5 feet 8 inches. Roof, shale ("draw slate"), overlain by sandstone; in places "sand rolls" cut through this roof and into the coal.

The bed was measured and sampled by C. W. Washburne in 1908, as described below:

Section of coal bed in Chandler mine at Chandler.

Laboratory No.	6254	
Roof, shale.	*Ft.*	*in.*
Coal	3	7
Bone [a]	0	10
Coal	0	6
Thickness of bed	4	11
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken from room 1, Cuckoo entry, and was dry when taken.

Notes.—The shale clings to the overlying sandstone and the coal breaks sharply from the shale when shot. When the mine was visited most of the coal was undercut with electric chain cutters. Output in 1910, 101,082 tons.

For chemical analyses of this coal see Part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 373.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

RADIANT. BRILLIANT MINE.

Sample.—Bituminous coal; Canon City field; analyses Nos. 6377, 6378, 6379 (p. 58).

Mine.—Brilliant in sec. 25, T. 20 S., R. 70 W., 3 miles south of Radiant.

Coal bed.—Cretaceous age, Vermejo formation. Thickness, about 6 feet; roof, shale 6 inches to 1 foot 2 inches thick overlain by sandstone; dip, 9° NW. The bed occurs probably at nearly the same horizon as the Brookside bed. In 1908 the mine was operated by a small shaft 96 feet deep.

The bed was measured and sampled by C. W. Washburne, in 1908, as described below:

Sections of coal bed in Brilliant mine, 3 miles south of Radiant.

Laboratory No.	6379	
Sandstone.		
Roof, shale.	*Ft.*	*in.*
Bone [a]	0	10
Shale [a]	0	½
Coal	5	0
Thickness of bed	5	10½
Thickness of coal sampled	5	0

[a] Not included in sample.

Samples 6377 and 6378 were taken 100 feet southwest of foot of shaft. Sample 6377 included bright shiny layers abundant in bony coal; sample 6378 included dull top coal.

Sample 6379 was taken 200 feet southwest of foot of shaft.

Notes.—The coal breaks readily along the bedding planes, a feature not observed elsewhere in this field. Neither face nor butt joints appear to be very regular in trend or in spacing.

The coal checks, but may be kept in stock for several months without noticeable deterioration and is said to be satisfactory for domestic use. The output of the mine when visited was from 12 to 15 tons a day; it was hauled by wagons to Radiant and there loaded on cars. The top coal, 1 to 3 feet thick, is not very clean but makes a satisfactory fuel for a steam boiler. In mining it is separated easily from the rest of the coal and was used in the operation of the mine. The shale ("draw slate") is removed in mining, leaving a sandstone roof. This top coal has a dull luster, doubtless due to its high ash content. The rest of the coal bed, which varies in thickness from 4 feet to 6 inches to 5 feet, is of a uniformly brilliant luster except for some dull layers, not over one-eighth inch thick.

For chemical analyses of this coal see part I of this bulletin, p. 58; also U. S. Geol. Survey Bull. 381, p. 374.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 342.

ROCKVALE. ROCKVALE MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6376 (p. 59).

Mine.—Rockvale; in sec. 25, T. 19 S., R. 70 W., Rockvale.

Coal bed.—Rockvale. Cretaceous age; Vermejo formation. Dip, westward, 6 to 6.5 per cent.; thickness, 3 feet 4 inches to 4 feet; floor, sandstone; roof, "draw slate" in places, sandstone in places. The mine shaft is 323 feet deep.

The bed was measured and sampled by C. W. Washburne, in 1908. The sample represented 3 feet 8 inches of coal.

The sample was taken in the first dip of the fourth north entry.

Notes.—Coal is mined by hand; long-wall system. The coal breaks down in lumps 1 to 3 feet across, with considerable quantities of finer débris. When the mine was visited the coal was dumped over screens directly into coal cars. The fine coal was washed but did not find a ready market, and in 1908 a large amount of slack had accumulated. The coal is mined principally for domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 381, p. 374.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

ROCKVALE. BLUFF SPRINGS (BLAZING RAG) MINE.

Sample.—Bituminous coal; Canon City field; analysis No. 6409 (p. 59).

Mine.—Bluff Springs (Blazing Rag); in sec. 6, T. 20 S., R. 69 W., 2 miles south of Rockvale.

Coal bed.—Rockvale. Cretaceous age, Vermejo formation. Thickness, 3 feet to 3 feet 6 inches, including a clay parting, 1 to 3 inches thick, near middle of bed; roof, dark, carbonaceous shale.

The bed was measured and sampled by C. W. Washburne, in 1908, as described below:

Section of coal bed in Bluff Springs mine, 2 miles south of Rockvale.

Laboratory No.	6409	
Roof, shale.	*Ft.*	*in.*
Coal	1	4
Clay [a]	0	4
Coal	1	8
Thickness of bed	3	4
Thickness of coal sampled	3	0

[a] Not included in sample.

Sample was taken of 3 feet of section of bed at point not indicated by the geologist.

Note.—The output of the mine in 1908 was small, and was hauled by wagon to Florence and neighboring towns.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 381, p. 374.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

WILLIAMSBURG. MAGNET MINE.

Sample.—Bituminous coal; Canon City field; analyses Nos. 10127, 10128, 10142 (p. 59).

Mine.—Magnet (often called the Ocean Wave); a slope mine near the center of sec. 19, T. 19 S., R. 69 W., Williamsburg.

Coal bed.—Magnet. Cretaceous age, Vermejo formation. Thickness, about 4 feet 6 inches, with a shale parting. The parting increases in thickness and coarseness of grain to northwest, becoming 2½ feet of sandstone at northwest end of mine. The bed shows three sets of joints. Dip for first 300 feet is 13° W., changing rapidly to 5° W., then to 4° W.

The bed was measured and sampled as described below:

Sections of coal bed in Magnet mine at Williamsburg.

Laboratory No.	10128		10127	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	2	2	3
Shale [a]	0	3½	0	4
Coal	1	10	1	11
Thickness of bed	4	3½	4	6
Thickness of coal sampled	4	0	4	2

[a] Not included in sample.

Sample 10127 was taken in south entry 3, 4,200 feet southwest of shaft.

Sample 10128 was taken in south entry 5, 3,200 feet southwest of shaft.

A composite sample was made by mixing samples 10127 and 10128 for an ultimate analysis, the results of which are shown under laboratory number 10142.

Notes.—The output of the mine was about 200 tons per day in 1908. About half the coal was machine mined. Three electric chain-breast machines were used. Considerable giant powder was used in parts of mine owing to hardness of coal and tightness with which it clings to roof and floor. Relative proportions of product were: Lump 51 per cent, nut 19 per cent, slack and pea 30 per cent.

For chemical analyses of this coal see part I of this bulletin, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, pp. 342–371.

GARFIELD COUNTY.

CARBONERA. PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3728 (p. 59).

Location.—Prospect on east side of gulch opposite Uinta mine (lower coal); in sec. 11, T. 7 S., R. 104 W., at Carbonera, 18 miles northwest of Mack.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. The rocks lie almost flat. Thickness of bed not on record.

Notes.—This coal, like most of the coal in the Book Cliffs field, is traversed by many joints and breaks easily after it is mined. The lumps, as mined, usually range in size from 30 inches down; there is a large amount of slack. The coal is used for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11; Bull. 316, p. 306.

CARBONERA. UINTA MINE.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 3729, 3732, 3734 (p. 59).

Mine.—Uinta; in sec. 14, T. 7 S., R. 104 W., near Carbonera.

Coal bed.—The bed is of Upper Cretaceous age, Mesaverde formation. The rocks lie almost flat.

The bed was measured and sampled at three points in the mine by G. B. Richardson in the summer of 1906, as shown below:

Sections of coal bed in Uinta mine, near Carbonera.

Section	A		B		C	
Laboratory No	3729		3732		3734	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	1	2	0	1	10
Bony coal	[a]0	1	[a]0	1	[a]0	1
Coal	0	10½	0	8	1	0
Bony coal	[a]0	5	[a]0	4	[a]1	1
Coal	4	0	4	3	3	6
Thickness of bed	7	5½	7	4	7	6
Thickness of coal sampled	6	11½	6	11	6	4

[a] Not included in sample.

Section A (sample 3729) was taken at the end of the back entry.

Section B (sample 3732) was taken near entrance of mine.

Section C (sample 3734) was taken in room 3.

Note.—This coal is used for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 316, p. 295; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

CARBONERA. SURFACE EXPOSURE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3730 (p. 59).

Location.—Surface exposure under waterfall; in sec. 16, T. 7 S., R. 102 W., 10 miles east of Carbonera, south of Turner's ranch.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Coal bed lenticular.

The bed was measured and sampled by George B. Richardson on August 30, 1906.

The sample was badly weathered. It represented coal bed 21 feet 5 inches thick.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

CARDIFF. BLACK DIAMOND MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 4030, 4037, 4038, 4040, 4050, 9143, 9144 (p. 59).

Mine.—Black Diamond; in the NE. ¼, SE. ¼ sec. 8, T. 7 S., R. 89 W., 8 miles southwest of Glenwood Springs and 4 miles southwest of Cardiff, on branch of the Colorado Midland Railway.

Coal bed.—Black Diamond 4-foot, 12-foot, and 16-foot. Cretaceous age, Mesaverde formation. Dip, 50° SW.

The mine was measured and sampled on October 3, 1906, by A. K. Adams and in 1908 by A. L. Beekly, as described below.

Sections of coal bed in Black Diamond mine, 8 miles southwest of Glenwood Springs.

Section	A		B		C	
Laboratory No	4037		4040		9143	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal [a]	..	..	2	2	..	..
Parting [a]	..	..	0	1	..	..
Coal [a]	..	..	1	10	..	..
Parting [a]	..	..	0	2	..	..
Coal	8	0	5	0	16	0
Thickness of bed	8	0	9	3	16	0
Thickness of coal sampled	8	0	5	0	16	0

[a] Not included in sample.

Sample 9143 was obtained 3,500 feet from mine mouth. Location of samples Nos. 4037 and 4040 not known. Sample 4040 was taken from upper bench of 16-foot bed. Sample 4037 was taken from the lower bench.

Sample 4038 was a composite sample of 4037 and 4040, and consequently represented the two main benches of the bed.

This bed was also measured and sampled in two places by A. K. Adams on October 23, 1906, and in one place by A. L. Beekly in 1909, as shown below:

Sections of coal bed in Diamond mine, 8 miles southwest of Glenwood Springs.

Section	A		B		C	
Laboratory No	4030		4050		9144	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	..	..	0	8	..	..
Coal	4	1	5	1	4	0
Bone [a]	..	..	0	8	..	..
Thickness of bed	4	1	6	5	4	0
Thickness of coal sampled	4	1	5	1	4	0

[a] Not included in sample.

Section A was taken from a 5-foot bench.

Section C was measured and sampled in first entry north, 800 feet west of mouth of mine.

Location of section B not known.

Notes.—The coal was mined by the room-and-pillar system.

For chemical analyses of this coal see part I of this bulletin, p. 59; also U. S. Geol. Survey Bull. 316, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 295.

MARION. MARION MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 9195, 9196, 9197, (p. 59).

Mine.—Marion; in the SE. ¼ SW. ¼ sec. 10, T. 8 S., R. 89 W., at Marion, on the Jerome Park Branch of the Colorado Midland Railroad.

Coal bed.—Allen and Anderson. The coal is of Cretaceous age, Measaverde formation. Thickness of bed, 4 to 6 feet; dip 36° S. 85° W. Roof, lenses of carbonaceous shale overlain with sandstone; floor, 6 to 10 inches of shale underlain with sandstone.

The beds were measured and sampled on September 30, 1909, by A. L. Beekly, as described below:

Sections of Allen coal bed in Marion mine, at Marion.

Laboratory No	9196		9195	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Shale lenses, thin, carbonaceous (up to 3 feet)	0	0	0	0
Coal	4	0	4	7
Shale parting [a]	0	2	..	..
Coal	1	0	..	..
Floor, shale, hard thin-bedded.				
Thickness of bed	5	2	4	7
Thickness of coal sampled	5	0	4	7

[a] Not included in sample.

Sample 9196 was taken 900 feet in mine, entry 1.

Sample 9195 was taken 200 feet from mouth of entry on south side of Marion Gulch.

Section of Anderson coal bed in Marion mine, at Marion.

Laboratory No	9197	
	Ft.	*in.*
Roof, sandstone.		
Shale [a] (varying up to 1 foot thick)	0	0
Coal free from partings	4	0
Floor, sandstone.		
Thickness of bed	4	0
Thickness of coal sampled	4	0

[a] Not included in sample.

The section (sample 9197) was taken about 1,200 feet in the mine, from the north entry, 25 feet from fault. The coal was wet.

Notes.—The coal from the Allen bed is bituminous noncoking, but occurs almost within the zone in which the Allen bed changes from noncoking to coking coal. The coal from the Anderson bed is a clean, hard, glossy coal of excellent quality, noncoking. The Anderson bed furnished about half of the 200-ton per day output of the Marion mine. The coal was used for engine coal by the Colorado Midland Railway.

For chemical analyses of this coal see part I of this bulletin, p. 60.

MARION. KEYSTONE PROSPECT.

Sample.—Bituminous coal; Glenwood Springs field; analysis No. 9202 (p. 60.)

Mine.—Keystone prospect; in SW. ¼ SE. ¼ sec. 9, T. 8 S., R. 89 W., 1 mile west of Marion, on the Jerome Park Branch of the Colorado Midland Railway.

Coal bed.—Keystone of U. S. Geological Survey; occupies about the same horizon as the Keystone beds of New Castle and South Canyon and is probably a continuation of that bed. Cretaceous age; Mesaverde formation. Thickness variable; dip, 34° S. 85° W., roof; sandy shale bedded; floor, 6-inch bed of carbonaceous shale underlain with sandstone.

The bed was measured and sampled by A L. Beekly, on September 30, 1909. The sample represented 3 feet 6 inches of coal.

The section (sample 9202) was taken in prospect near surface.

Note.—Analysis No. 9202 is not a true representation of the value of this coal bed as the sample was considerably weathered and contained some foreign material which had been washed in.

For chemical analyses of this coal see part I of this bulletin, p. 60.

Newcastle. Keystone Mine.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 3932, 3936, and 8807 (p. 60).

Mine.—Keystone; in the NE. ¼ sec. 4, T. 6 S., R. 91 W., 1 mile southwest of Newcastle, on the Denver & Rio Grande and the Colorado Midland railroads.

Coal beds.—Keystone No. 1 and No. 2. The coal is of Cretaceous age, Mesaverde formation. Thickness of bed No. 2 is somewhat variable, averaging about 30 inches; dip, 37° S. 20° W.; roof, hard, thin bedded shale overlain with shale, alternating with thin sandstone. Shale often falls with the coal, which necessitates hand sorting. Floor, sandstone; cover 100 to 300 feet thick. Bed No. 1 is about 2 feet thick.

The beds were sampled and measured by H. S. Gale, who obtained samples from bed No. 1 (Nos. 3932 and 3936) in October, 1906, and A. L. Beekly, who took sample from bed No. 2 (No. 8807) in July, 1909, as described below:

Samples 3932 and 3936 were taken 600 feet down the slope, at the lowest level from a 2-foot bed, 20-inch cut.

Sample 8807 was taken from face of entry, about 1,200 feet northwest of opening. It represented a 26-inch cut.

Notes.—This coal is hard and is said to be good, though it slacks quickly and must be used soon after being mined. It is an excellent domestic coal, and the entire product was consumed in near-by towns. In 1908 and 1909 the capacity of the mine was approximately 1,000 tons per month in winter and about 100 tons per month in summer.

For chemical analyses of this coal see Part I of this bulletin, p. 60, also U. S. Geol. Survey Bull. 316, p. 290; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 415, p. 112.

Newcastle. Coryell Mine.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 8806, 3933, 3935, 3937, 3938, and 3939 (pp. 60, 61).

Mine.—Coryell; in the NW. ¼ sec. 2, T. 6 S., R. 91 W., about ½ mile southeast of Newcastle, on the Colorado Midland Railway.

Coal bed.—Allen. Cretaceous age, Mesaverde formation. Thickness diminishes slowly but gradually toward the east. Dip, 47° S., 17° W.; roof, hard, gray sandstone with occasional shale lenses between sandstone and coal; floor, sandstone with 6 inches to 1 foot of hard, carbonaceous shale between sandstone and coal. This hard shale is somewhat difficult to separate from the coal.

The bed was measured and sampled by A. L. Beekly on July 26, 1909, as described below:

Section of coal bed in Coryell mine, ½ mile southeast of Newcastle.

Laboratory No	8806	
Roof, hard, gray sandstone.	*Ft.*	*in.*
Shale lenses (varying up to 14 inches)	0	0
Coal	13	6
"Black Jack" or "mining," black, crushed and glistening coal (varying from 0 to 12 inches)[a]	0	6
Coal	1	6
Floor, shale, hard, sandy, carbonaceous.		
Thickness of bed	15	6
Thickness of coal sampled	10	0

[a] Not included in sample.

Sample 8806 was taken near the face of entry, about 1,800 feet west of mine opening.

Sample 3933 was taken by A. K. Adams on October 12, 1905, 1,200 feet from the mine mouth. It included the bottom 4 feet 6 inches of the bed.

Sample 3935 was taken by A. K. Adams on October 12, 1906, 1,200 feet from mine mouth. It included the upper 9 feet of the bed.

Sample 3937 was taken by A. K. Adams on October 12, 1906, 1,200 feet in mine. It included best coal of 5-foot bench.

Sample 3938 was taken by A. K. Adams on October 11, 1906, 1,200 feet in mine. It included the upper 9 feet 4 inches of 14-foot bed, except "Black Jack," 2 feet, near middle.

Sample 3939 was taken by A. K. Adams on October 12, 1906, 1,200 feet in mine. It included entire bed.

Notes.—This coal is hard, clean, and of good quality. It cakes sufficiently to make excellent engine coal, for which purpose practically all of the product was used by the Colorado Midland Railway Co. It will coke in a retort oven, but not under the ordinary process. The capacity of mine was about 300 tons per day.

For chemical analyses of this coal see part I of this bulletin, pp. 60, 61; also U. S. Geol. Survey Bull. 316, p. 299; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 291; Bull. 415, p. 130.

NEWCASTLE. COAL RIDGE MINE.

Sample.—Bituminous coal; Glenwood Springs field; analysis No. 8804 (p. 61).

Mine.—Coal Ridge; prospect near abandoned Coal Ridge mine in the NW. ¼ sec. 8, T. 6 S., R. 90 W., 3¾ miles southeast of Newcastle, on the Colorado Midland Railway.

Coal bed.—C. Mesaverde formation, Cretaceous age. Thickness, somewhat variable; dip, about 50° S. 18° W.; roof, hard grayish-yellow shale of peculiar structure; crushing or stress of some nature has apparently produced fracture planes extending in all directions; floor, shale.

The bed was measured and sampled by A. L. Beekly August 2, 1909, the sample including 5 feet of coal.

The section (sample 8804) was taken 50 feet east of mouth of prospect.

Notes.—This coal is hard, clean, and apparently of good quality. The prospect has been open for years, and although the face of the bed was well cleaned off, the sample was undoubtedly somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 61.

RIFLE CREEK. McLEARN MINE.

Sample.—Bituminous coal; Grand Hogback field; analyses Nos. 3943, 3946 (p. 61).

Mine.—McLearn; a drift mine on Rifle Creek, in sec. 12, T. 5 S., R. 93 W., north of Grand River and 10 miles north of Rifle. No railroad connection.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. Thickness, 7 feet 3 inches; roof, flaggy sandstone.

The bed was measured and sampled on October 4, 1906, by Hoyt S. Gale.

Sample 3943 included a 7¼-foot cut from the lowest thick bed.

Sample 3946 included a 5¾-foot cut of the best coal in the bottom part of the bed.

The samples were obtained 1,000 feet in mine.

Notes.—This bed is without partings, although a foot or so at the upper or hanging-wall side is softer than the rest and usually breaks up in mining, so that it is lost as slack. The coal is dusty.

For chemical analyses of this coal see part I of this bulletin, p. 61; also U. S. Geol. Survey Bull. 316, p. 299.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 289.

SOUTH CAÑON. SOUTH CAÑON MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 3959, 3960, 3961, 8805, 8808, 8811, 8812 (p. 61).

Mine.—South Cañon; in the NW. ¼ sec. 14, T. 6 S., R. 90 W., South Cañon, about 2 miles south of station.

Coal beds.—D, E, Allen, and Wheeler. The coal is of Cretaceous age, Mesaverde formation. Thickness, variable; dip, 50° SW.; roof, shale; floor, shale.

The beds were measured and sampled on August 7, 1909, by A. L. Beekly and in 1906 by A. K. Adams, as shown below:

Sample 3961 was taken from the D bed, 2,000 feet from entrance of mine, and included 4 feet 8 inches of clean coal.

Sample 8812 was taken from the D bed at the face of entry 3, 2,200 feet northwest of mine opening. The sample included a 4½-foot cut of coal.

Sample 8805 was taken from the E bed in entry 1, about 400 feet northwest of the mouth of the east entry of the mine.

Sections of Wheeler coal bed in South Cañon mine, near South Cañon.

Laboratory No	3959		3969		8808	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal, hard, bright, and clean	5	4	2	2	12	6
Black jack; crushed, granular coal	..	..	..	..	0	4
Coal	12	8	15	10	1	6
Floor, shale.						
Thickness of bed	18	0	18	0	14	4
Thickness of coal sampled	12	8	15	10	9	0

Sample 8808 was taken at the face of entry 2, about 2,400 feet northwest of mine mouth.

Sample 3960 was taken in the mine on the west side of gulch, 2,250 feet from entrance. The sample represented 15 feet 10 inches of coal from the lower part of the bed. Sample 3959 was taken on the east side of gulch, 2,650 feet from entrance to mine. The sample represented 12⅔ feet of coal from the lower part of the bed.

The Allen coal bed in this mine was measured and sampled by A. L. Beekly on August 7, 1909. The sample (8811) represented a 5½-foot cut of coal. It was taken at face of entry, about 250 feet west of opening.

Notes.—This coal is very hard and clean and has a black, glossy luster. Except for the one parting of black jack, or crushed coal, the bed is all coal. The South Cañon mine produced (in 1909) about 175 tons per day, practically all of which came from the Wheeler bed. The product was mainly used for engine coal by the Colorado Midland Railway.

For chemical analyses of this coal see part I of this bulletin, p. 61; also U. S. Geol. Survey Bull. 316, p. 300; Bull. 415, p. 130.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 291; Bull. 415, p. 249.

SOUTH CAÑON. MARTIN OHKRAUT MINE.

Sample.—Bituminous coal; Glenwood Springs field; analysis No. 8809 (p. 61).

Mine.—Martin Ohkraut; a drift mine in sec. 23, T. 6 S., R. 90 W., about 3 miles south of the station on the Colorado Midland Railway at South Cañon.

Coal bed.—Keystone No. 2. Cretaceous age, Mesaverde formation. Thickness, variable; dip, 42° S., 40° W.; roof, thin-bedded shale; floor, shale.

The bed was measured and sampled by A. L. Beekly, August 12, 1909, the sample representing 3 feet 6 inches of coal.

The sample and section of the bed were taken about 150 feet northwest of the mouth of the mine.

Notes.—At the time the mine was visited the coal was only mined for the domestic use of the owner. The bed contains considerable dirt and is somewhat broken up, probably due to the effects of slumping.

For chemical analyses of this coal see part I of this bulletin, p. 61.

Sunlight. Sunlight Mine.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 4032, 4033, 4034, 4045, 4046, 4048 (p. 62).

Mine.—Sunlight; a drift mine, 15 miles south of Glenwood Springs, in sec. 33, T. 7 S., R. 89 W., at Sunlight.

Coal beds.—A, B, C, D. The coal is of Cretaceous age, Mesaverde formation. Dip 44° W.

The beds were measured and sampled by A. K. Adams on October 23, 1906, as described below:

Sections of D coal bed in Sunlight mine at Sunlight.

Laboratory No	4048		4033	
	Ft.	in.	Ft.	in.
Coal[a]	1	9	7	4
Shale[a]	0	1	..	..
Coal	6	5½	1	8
Thickness of bed	8	3½	9	0
Thickness of coal sampled	6	5½	7	4

[a] Not included in sample.

Sample 4048 was taken at a point 3,300 feet from mine mouth.

Sample 4033 was taken from a point 2,500 feet from mine mouth. It included only the upper 7 feet 4 inches of the bed.

Section of C coal bed in Sunlight mine at Sunlight.

Laboratory No	4045	
	Ft.	in.
Coal	3	0
Shale[a]	1	6
Coal	3	0
Thickness of bed	7	6
Thickness of coal sampled	6	0

[a] Not included in sample.

Sample 4045 was taken at point 1,100 feet from mine mouth.

Sample 4046 was taken from the B bed at point 1,100 feet from mine mouth. It represented entire bed of 6 feet. The coal sampled was weathered.

Sample 4032 was taken from the A bed at a point 3,000 feet from mine mouth, where it measured 9 feet in thickness; only the lower 7 feet 6 inches of bed was sampled.

Sample 4034 was taken from the A bed at a point 3,500 feet from mine mouth, where it measured 10 feet 9 inches; only the lower 10 feet 2 inches of coal was sampled. This was overlain with 7 inches of coal.

Notes.—The A bed varies somewhat in thickness and runs high in slack. The B bed is too soft and crumbly to be of use. The C bed is considered unsatisfactory for mining on account of the parting in the middle. The D bed is considered good coal. The coal is said to be noncoking, and the whole output is used for roasting ore.

For chemical analyses of this coal see part I of this bulletin, p. 62; also U. S. Geol. Survey Bull. 316, p. 300; Bull. 415, p. 250.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 293; Bull. 415, p. 250.

Sunlight. Mascot Mine.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 9200, 9201 (p. 62).

Mine.—Mascot; in the NW. ¼ NE. ¼ sec. 28, T. 7 S., R. 89 W., 1 mile north of Sunlight.

Coal bed.—A. Cretaceous age, Mesaverde formation. From the mine opening, which is located near the northeast corner of sec. 28, a tunnel was driven in almost a due west direction. This tunnel was driven through approximately 100 feet of talus and slide material before rocks in place were found. At about 635 feet from the opening, the lowest coal bed of the entire group was intersected, and about 50 feet farther the second bed was found and an entry driven upon it for a distance of 700 to 800 feet north. The only evidence for the correlation of these beds is that they are the lowest beds of the series and as such might be correlated with the A and B beds of the Sunlight section.

The bed was measured and sampled at two points in the mine by A. L. Beekly on September 17, 1909, as shown below.

Section of upper A coal bed in Mascot mine at Sunlight.

Laboratory No.	9200	
Roof, sandstone.	*Ft.*	*in.*
Shale, hard, coaly [a]	0	6
Coal, clean, bright, and hard	2	6
Bone coal [a]	0	5
Coal	1	0
Bone [a]	0	2
Coal, soft	2	0
Floor, sandstone.		
Thickness of bed	6	7
Thickness of coal sampled	5	6

[a] Not included in sample.

Section of lower A coal bed in Mascot mine at Sunlight.

Laboratory No.	9201	
Roof, sandstone.	*Ft.*	*in.*
Shale, miners' "soapstone" [a]	0–2	0
Coal, hard and clean	2	0
Coal, bony and dirty, miners' "Black Jack" [a]	1	5
Coal	1	0
Floor, shale.		
Thickness of bed	4	5
Thickness of coal sampled	3	0

[a] Not included in sample.

Section 9200 was taken from the upper part of the bed.

Section 9201 was taken from the lower part of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 62.

SUNLIGHT. MIDLAND MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 9191, 9192, 9193, 9194 (pp. 62, 63).

Mine.—Midland; in the NW. ¼ SW. ¼ sec. 34, T. 7 S., R. 89 W., near Sunlight.

Coal beds.—A, B, C, and D. Beds A and D are the only ones mined at the present time, as they are more easily workable than the B and C, the former of which is so soft as to pulverize badly in mining and the latter of which contains sandstone lenses which make it unsatisfactory to work. Cretaceous age, Mesaverde formation.

The coal beds in this mine were measured and sampled by A. L. Beekly, on September 16, 1909, as shown below:

Section of C coal bed in Midland mine, near Sunlight.

Laboratory No.	9191	
Roof, shale, "shell rock" composed almost entirely of fossil shells.	*Ft.*	*in.*
Coal free from partings, hard, good quality	4	0
Coal, soft	2	0
Floor, shale.		
Thickness of coal bed	6	0

Section of A coal bed in Midland mine, near Sunlight.

Laboratory No	9193	
Roof, shale; hard, miners' slate.	*Ft.*	*in.*
Coaly shale [a]	1	0
Coal	6	0
Floor, shale.		
Thickness of coal bed	7	0
Thickness of coal sampled	6	0

[a] Not included in sample.

Sample 9191 was taken 1,100 feet south and about 20 feet west of the opening, C bed.

Sample 9192 represented 6 feet of soft coal of poor quality. It was taken from bed B, 1,100 feet from the mine entrance.

Sample 9194 represented 6 feet of clean, hard coal, free from partings. It was taken from bed D.

Notes.—At the time of sampling the mine employed about 60 men and was producing about 350 tons per day, practically all of which was used by the Colorado Midland Railway for steam coal.

For chemical analyses of this coal see part I of this bulletin, pp. 62, 63.

SUNLIGHT. POCAHONTAS MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 4036, 4039, 4031, 4035 (p. 63).

Mine.—Pocahontas, in sec. 27, T. 7 S., R. 89 W., 1 mile north of Sunlight, on branch of Colorado Midland Railway.

Coal beds.—A, C, and D beds. Cretaceous age, Mesaverde formation. Strike, nearly 14° W.; dip, 42° SW.

The beds were measured and sampled on October 23, 1906, by A.K. Adams, as shown below:

Section of coal bed C in Sunlight mine 1 mile north of Sunlight.

Laboratory No	4031	
Roof, shale.	*Ft.*	*in.*
Coal	3	11
Shale [a]	4	0
Coal	3	6
Floor, shale.		
Thickness of bed	11	5
Thickness of coal sampled	7	5

[a] Not included in sample.

Sample 4031 was taken from the C bed, 2,200 feet from the mine entrance.

Sample 4036 represented 9¼ feet of coal, which was overlain with 8 inches of coal not included in the sample. It was taken from the D bed.

Sample 4039 represented 7½ feet of coal, which was underlain with 1½ feet of coal not included in the sample. It was taken from the D bed.

Sample 4035 represented 6⅙ feet of coal, which was underlain with 9 feet of bony coal not included in the sample. It was taken from the upper bench of the A bed.

Notes.—In 1907 the output was reported to be about 150 tons daily. The coal was graded and marketed in different grades of sizes.

For chemical analyses of this coal see part I of this bulletin, p. 63; also U. S. Geol. Survey Bull. 415, p. 249.

GUNNISON COUNTY.

CRESTED BUTTE. CRESTED BUTTE MINE.

Sample.—Bituminous coal; Crested Butte field; analyses Nos. 7982, 7983, 8655 (p. 63).

Mine.—Crested Butte; a drift mine in sec. 3, T. 14 S., R. 86 W., at Crested Butte.

Coal bed.—The coal is of Cretaceous age and is bed No. 3 of the Crested Butte field or the third coal from the base of the Mesaverde formation, formerly known as the Laramie. The thickness is very irregular from rock movements, varying from half an inch to 22 feet and the bed is irregular in degree and direction of dip. The roof and floor consist principally of shale.

The bed was measured and sampled by W. T. Lee on June 23, 1909, as described below:

Section of coal bed in Crested Butte mine at Crested Butte.

Laboratory No.	7982	
Roof, shale.	*Ft.*	*in.*
Coal	4	11
Shale [a]	0	¼
Coal [a]	6	1
Floor, shale.		
Thickness of bed	11	¼
Thickness of coal sampled	4	11

[a] Not included in sample.

Sample 7982 was taken ¼ mile south of mine mouth.

Sample 7983 included a 73-inch cut from the lower bench. It was taken ¼ mile south of the mine mouth.

Sample 8655 represented weathered coal collected at the outcrop near the mouth of the mine. It included both benches of the Crested Butte bed.

Notes.—The mine samples were collected from a working face one-quarter mile south of the mouth of the mine. The coal is hard, bright bituminous, and is of coking quality. At time of sampling it was used on railway locomotives and for the manufacture of coke.

For chemical analyses of this coal see part I of this bulletin, p. 63.

CRESTED BUTTE. PORTER MINE.

Sample.—Bituminous coal; Crested Butte field; analysis No. 7981 (p. 63).

Mine.—Porter; a drift mine located ¾ mile southwest of Crested Butte in the NW. ¼ NW. ¼ sec. 11, T. 14 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is coal bed No. 3 of the Crested Butte field or the third coal from the base of the Mesaverde formation, formerly known in this region as Laramie. The thickness is regular and the bed dips toward the northwest. The roof is shale and the floor is shale, under which is sandstone.

The bed was measured and sampled by W. T. Lee on June 19, 1909, as described below:

Section of coal bed in Porter mine near Crested Butte.

Laboratory No.	7981	
Roof, shale.	*Ft.*	*in.*
Coal	6	1
Shale [a]	0	¼
Coal	6	8
Shale [a]	0	6
Sandstone	..	..
Floor, shale.		
Thickness of bed	13	3¼
Thickness of coal sampled	12	9

[a] Not included in sample.

Notes.—The sample was collected from a working face between the south cross entries 2 and 3. The coal is a hard, clean, bituminous coal, and like most of the bituminous coals in the Crested Butte field is of coking quality. Most of the output is used on railway locomotives and for domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 63.

Crested Butte. Silver Brook Mine.

Sample.—Anthracite coal; Crested Butte field; analyses Nos. 7978, 7979 (p. 63).

Mine.—Silver Brook; shaft and drift mines in sec. 28, T. 13 S., R. 86 W., 1 mile north of the town of Crested Butte.

Coal bed.—No. 1 and another bed considerably higher than No. 1 whose exact horizon is not known. The coal is of Cretaceous age, Mesaverde formation. Thickness is irregular; dips somewhat. Roof and floor of upper bed are both shale.

The beds were measured and sampled by W. T. Lee on June 20, 1909.

Sample 7978 from the No. 1 bed represented 2 feet 3 inches of coal.

It was taken from a working face 118 feet under ground and 400 feet north of shaft.

Section of upper bed was taken as described below.

Section of coal bed in the upper workings of the Silver Brook mine near Crested Butte.

Laboratory No	7979	
Roof, shale.	*Ft.*	*in.*
Coal	1	4
Shale [a]	0	1
Coal	1	9
Shale [a]	0	4
Floor, shale.		
Thickness of bed	3	6
Thickness of coal sampled	3	1

[a] Not included in sample.

Sample 7979 was collected from the working face in room 1 in north cross entry 2, and included both benches of coal, from which the shale was separated.

Note.—The coal is a hard, bright anthracite, and in 1909 was used principally as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 63.

Crested Butte. Bulkley Mine.

Sample.—Bituminous coal; Crested Butte field; analyses 7980, 9139 (p. 63).

Mine.—Bulkley; a drift mine, 1 mile southeast of Crested Butte in the NW. ¼ NW. ¼ sec. 11, T. 14 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is coal bed No. 3 of the Crested Butte field, or the third bed above the base of the Mesaverde formation (formerly known as Laramie in this region). The bed lies nearly horizontal and has a sandstone roof and shale floor.

The bed was measured and sampled by W. T. Lee and J. B. Mertie on June 19, 1909, as shown below:

Section of coal bed in Bulkley mine near Crested Butte.

Laboratory No	7980	
Roof, sandstone.	*Ft.*	*in.*
Bone [a]	1	1
Coal	4	2
Shale [a]	0	5
Coal [a]	0	4
Floor, shale.		
Thickness of bed	6	0
Thickness of coal sampled	4	2

[a] Not included in sample.

Sample 7980 was collected from a working face in cross entry 2 and included only the coal of the main bench, 4 feet 2 inches thick at this point. The thickness varies greatly, due to the crushing of the coal by rock movements.

Bed No. 4 of the Crested Butte field, or the fourth bed above the base of the Mesaverde formation, was measured and sampled in this mine by J. B. Mertie August 21, 1909, the sample representing 6 feet 5 inches of coal. It was taken from a working face 100 feet south of the mouth of the mine.

Notes.—The coal is bituminous and like most of the bituminous coals of the field it cokes. The mine opening in this bed of coal was in process of development at the time of investigating. No coal had been shipped. Output in 1910, 35,238 tons.

For chemical analyses of this coal see part I of this bulletin, p. 63.

Crested Butte. Deserted Drift Mine.

Sample.—Bituminous coal; Crested Butte field; analysis No. 7977 (p. 63).

Mine.—A deserted drift about 2 miles southwest of the town of Crested Butte in sec. 14, T. 14 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is the lowest bed of coal No. 1 of the Crested Butte field. It lies at the base of the Mesaverde formation (formerly called the Laramie in this region). The roof was not seen, but the floor is sandstone.

The bed was measured and sampled by E. L. Degolyer on June 21, 1909, the sample representing slightly more than 6½ feet of coal.

Notes.—The sample was cut from a freshly cleared face 125 feet from the mouth of the opening. The coal, although close to the igneous rock of the Mount Wheatstone laccolith, is not metamorphosed. It is a hard bituminous, and supposed to be a coking coal like most of the bituminous coals of the Crested Butte field. The mine had not been operated for five years previous to the time of investigating it.

For chemical analyses of this coal see part I of this bulletin, p. 63.

Crested Butte. Robinson Mine.

Sample.—Anthracite coal; Mount Carbon field; analysis No. 8246 (p. 63).

Mine.—Robinson; a drift mine located at the east extremity of the Mount Carbon field, 5 miles southeast of Crested Butte, 6 miles northeast of the town of Mount Carbon in sec. 36, T. 14 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is coal bed No. 2 of the Mount Carbon field, but is the lowest one at this place, as coal No. 1 does not occur here. It is in the Paonia member of the Mesaverde formation. The thickness is regular and the bed lies nearly horizontal. The roof and floor are both shale.

The bed was measured and sampled by W. T. Lee on July 1, 1909, the sample representing 5 feet 11 inches of coal.

Notes.—The sample was collected from a working face 300 feet from the mouth of the mine and represented the entire bed. The coal is a hard bright anthracite resulting from the metamorphism of the bituminous coal of No. 2 bed by the igneous rock of Mount Wheatstone, which overlies the coal in this locality.

For chemical analyses of this coal see part I of this bulletin, p. 63.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

Floresta. Ruby Mine.

Sample.—Anthracite coal; Floresta field; analysis No. 8120 (p. 64).

Mine.—Ruby; a drift mine located in the Floresta field, at the town of Floresta, in sec. 16, T. 14 S., R. 87 W.

Coal bed.—The coal is of Cretaceous age and lies near the base of the Mesaverde formation (formerly known in this region as the Laramie). The thickness is regular and the bed inclines steadily to the north. The roof is sandstone in some places and shale in other places.

The bed was measured and sampled by W. T. Lee on June 20, 1909, the sample representing 4 feet 5 inches of coal.

Notes.—The sample was collected from a working face in entry 5 and represented the entire bed. The coal is a hard bright anthracite and in 1909 was used principally on railway locomotives and as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 64.

MOUNT CARBON. ALPINE MINE.

Sample.—Bituminous coal; Mount Carbon field; analyses Nos. 8618, 10092 (pp. 63, 64).

Mine.—Alpine; at Mount Carbon (formerly Baldwin), in sec. 7, T. 15 S., R. 86 W., on the Colorado Southern Railroad.

Coal bed.—The coal is of Cretaceous age and is designated as coal No. 2 of the Mount Carbon field. It is lowest bed in the Paonia member of the Mesaverde formation. The thickness is uniform and the bed is somewhat inclined.

The bed was measured and sampled (8618) by W. T. Lee on July 20, 1909, the sample representing 6 feet 10½ inches of coal, taken from room 20, seventh main entry.

The bed was also measured and sampled (10092) on March 14, 1910, by G. T. Peart. The sample was taken in north entry 6, 2,500 feet from opening, and represented 6 feet 5 inches of coal.

Notes.—The sample was collected from a working face in room 20, off main entry 7 and included the entire bed. The coal is a hard variety of bituminous, supposed to be of coking quality, but in 1909 was used principally for steaming and domestic purposes.

For chemical analyses of this coal see part I of this bulletin, pp. 63, 64.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

MOUNT CARBON. LA PLANT MINE.

Sample.—Bituminous coal; Mount Carbon field; analysis No. 8619 (p. 64).

Mine.—La Plant; ½ mile southwest of Mount Carbon in sec. 18, T. 15 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and lies at the base of the Bowie member of the Mesaverde formation. The coal is irregular in thickness and the bed dips slightly to the west.

The bed was measured and sampled by W. T. Lee July 22, 1909, as described below:

Section of coal bed in La Plant mine, one-half mile southwest of Mount Carbon.

Laboratory No	8619	
	Ft.	*in.*
Roof, shale.		
Bone[a]	0	2
Coal	1	7
Bone[a]	0	9
Coal	1	9
Bone[a]	0	10
Floor, shale.		
Thickness of bed	5	1
Thickness of coal sampled	3	4

[a] Not included in sample.

Note.—This sample was collected from a working face, 400 feet west of the bottom of the shaft.

For chemical analyses of this coal see part I of this bulletin, p. 64.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

MOUNT CARBON. ABANDONED DRIFT MINE.

Sample.—Bituminous coal; Mount Carbon field; analysis No. 8620 (p. 64).

Mine.—Abandoned drift mine; about 2 miles east of Mount Carbon, in sec. 31, T. 15 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is at the base of the Bowie member of the Mesaverde formation. The roof and floor of the mine are shale. The bed was measured and sampled by W. T. Lee on July 23, 1909, the sample representing 8 feet of coal.

Notes.—The sample was collected from a freshly cleaned face 50 feet from opening in the abandoned entry.

For chemical analyses of this coal, see part I of this bulletin, p. 64.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 341, p. 320.

MOUNT CARBON. DESERTED MINE.

Sample.—Bituminous coal; Mount Carbon field; analysis No. 8616 (p. 64).

Mine.—Deserted mine; about 3 miles east of Mount Carbon, in sec. 15, T. 15 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is probably coal No. 2 of this field. It is in the Paonia member of the Mesaverde formation. The thickness is regular and the bed dips toward the west.

The bed was measured and sampled by W. T. Lee on July 18, 1909, as described below:

Section of coal bed in deserted mine at Mount Carbon.

Laboratory No	8616	
Roof, sandstone.	*Ft.*	*in.*
Coal	4	2
Shale [a]	0	1
Coal	1	6
Thickness of bed	5	9
Thickness of coal sampled	5	8

[a] Not included in sample.

Notes.—The sample was collected from a freshly cleared face 275 feet north and 50° west of the mouth of the opening. The coal is a clean hard variety of bituminous, supposed to be of coking quality.

For chemical analyses of this coal see part I of this bulletin, p. 64.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

MOUNT CARBON. KUBLER MINE.

Sample.—Bituminous coal; Mount Carbon field; analyses Nos. 8617, 10091 (p. 64).

Mine.—Kubler; a drift mine 3 miles northeast of Mount Carbon, in sec. 4, T. 15 S., R. 86 W.

Coal bed.—The coal is of Cretaceous age and is bed No. 2 of the Mount Carbon field, 85 feet above the base of the coal-bearing rocks. It is in the Paonia member of the Mesaverde formation. The thickness is regular and the bed dips toward the west. (Sample 10091 was taken from the Kubler bed.)

The bed was measured and sampled by W. T. Lee on July 21, 1909, as described below:

Section of coal bed in the Kubler mine, 3 miles northeast of Mount Carbon.

Laboratory No	8617	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	9
Coal, bony [a]	0	7
Coal	2	2
Bone [a]	0	1½
Coal	3	4
Floor, shale.		
Thickness of bed	6	11½
Thickness of coal sampled	5	6

[a] Not included in sample.

Sample 8617 was collected at end of main entry from a working face about 4,000 feet from the mouth of the mine.

The Kubler bed was measured and sampled on March 15, 1910, by G. T. Peat. The sample (10091) was taken in north entry 2, 950 feet from opening, and represented 6 feet 3 inches of clean coal, on the bottom of which was 2 inches of bone.

Notes.—The daily output of the mine at time of sampling in 1910 was 300 tons. The coal is a hard clean variety of bituminous, supposed to be of coking quality, but in 1909 was used only for steam and domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 64.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

SOMERSET. SYLVESTER PROSPECT.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5406 (p. 64).

Mine.—Sylvester opening and prospect; Somerset district; in the north wall of the canyon of the north fork of the Gunnison River, 1 mile east of Somerset, in sec. 11, T. 13 S., R. 90 W.

Coal bed.—The coal is of Cretaceous age and is probably the lowest bed in the Paonia member of the Mesaverde formation. The bed lies nearly horizontal and has a shale roof and a shale floor.

The bed was measured and sampled by W. T. Lee on September 22, 1907, the sample representing 5 feet 10 inches of coal.

Notes.—The sample was collected from a freshly cleared face, 70 feet from the mouth of the opening. The coal is a hard, coking, bituminous, and small amounts of it are mined each winter for domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 64; also U. S. Geol. Survey Bull. 341, pp. 333–332.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

SOMERSET. HAWK'S NEST MINE.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5405 (p. 64).

Mine.—Hawk's Nest, a drift mine in the Somerset district, in the north fork of the Gunnison, 2 miles east of Somerset, in sec. 11, T. 13 S., R. 90 W.

Coal bed.—The coal is of Cretaceous age and is in the Paonia member of the Mesaverde formation. The roof is of shale, but the base of the coal bed was not seen.

The bed was measured and sampled by W. T. Lee September 22, 1907. The sample represents upper 5 feet of coal sampled from a bed of 7 feet of coal.

Notes.—The sample was collected from a working face, 100 feet from the mouth of the opening. The lower part of bed was not included because of standing water. The coal is a hard, coking, bituminous, but in 1907 was used only for domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 64; also U. S. Geol. Survey Bull. 341, p. 334.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

SOMERSET. SHOECROFT PROSPECT.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5807 (p. 64).

Mine.—Shoecroft prospect (Porter claims) on Minnesota Creek, in the Somerset district, about 9 miles east of Paonia and 4 miles south of Somerset, in sec. 32, T. 13 S., R. 90 W.

Coal bed.—The coal is of Cretaceous age and is in the Bowie member of the Mesaverde formation. The bed was measured and sampled by W. T. Lee on October, 1907, the sample representing 7 feet of coal.

The sample was taken 25 feet in the mine.

For chemical analyses of this coal see part I of this bulletin, p. 64; also U. S. Geol. Survey Bull. 341, p. 334.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

SOMERSET. SIMONTON PROSPECT.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5529 (p. 64).

Mine.—Simonton prospect (Porter claims), a prospect opening in the Somerset district, about 12 miles east of Paonia and 7 miles south of Somerset, in sec. 22, T. 14 S., R. 90 W.

The bed was measured and sampled by W. T. Lee on September 9, 1907, as shown below:

Section of coal bed in Simonton prospect, 7 miles south of Somerset.

Laboratory No	5529	
Roof, shale.	*Ft.*	*in.*
Coal [a]	2	10
Shale [a]	0	10
Coal [a]	1	2
Shale [a]	0	5
Coal [a]	13	1
Shale [a]	6	0
Coal [b]	16	0
Coal, bony [a]	2	0
Coal [a]	7	2
Shale [a]	2	0
Shale and sandstone with 4-foot oyster bed [a]	12	0
Coal [a]	1	0
Floor, shale.		
Thickness of bed	64	6
Thickness of coal sampled	7	0

[a] Not included in sample. [b] Upper 7 feet only included in sample.

Note.—The sample was collected near the surface.

For chemical analyses of this coal see part I of this bulletin, p. 64; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 319.

SOMERSET. PORTER PROSPECT.

Sample.—Bituminous to anthracite coal; Grand Mesa field, analysis No. 5528 (p. 65).

Mine.—Porter prospect, driven along the strike of a steeply dipping bed in the south slope of Mount Gunnison; 8 miles northeast of Crawford and 9 miles southeast of Somerset, in sec. 3, T. 14 S., R. 89 W. of the projected Survey. The coal is very irregular in thickness and the bed dips 45 degrees.

The bed was measured and sampled by W. T. Lee on September 6, 1907, as described below.

Section of coal bed in Porter prospect, 9 miles southeast of Somerset.

Laboratory No	5528	
Roof, sandstone.	*Ft.*	*in.*
Shale [a]	4	0
Coal	8	0
Igneous rock [a]	1	6
Floor, sandstone.		
Thickness of bed	13	6
Thickness of coal sampled	5	6

[a] Not included in sample.

Notes.—The sample was collected from a working face, 250 feet from the mouth of the entry. The coal is hard, the so-called anthracite of the West Elk Mountain region, but is really a coking coal. The coking bituminous coal of this region has become hardened by the intrusion of the igneous rock. The coal is crushed by faulting and other movements.

For chemical analyses of this coal see part I of this bulletin, p. 65; also U. S. Geol. Survey Bull. 341, p. 334.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 319.

SOMERSET. MOSELY MINE.

Sample.—Bituminous coal; Grand Mesa field analysis No. 5344 (p. 65).

Mine.—Mosely, a drift mine in the Coal Creek district, 9½ miles southeast of Somerset, in sec. 10, T. 14 S., R. 89 W.

Coal bed.—The coal is of Cretaceous age and is in the Bowie Member of the Mesaverde formation. The thickness is regular and the bed dips about 4° to the north. The roof and floor consist of shale.

The bed was measured and sampled by W. T. Lee on September 14, 1907, the sample representing upper 7 feet of coal taken from a bed of slightly over 10 feet of coal.

Note.—The sample was collected from a working face 60 feet from the mouth. The coal is a very hard variety of coking bituminous. In 1907 it was used locally as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 65; also U. S. Geol. Survey Bull. 341, p. 334.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, pp. 319–332.

SOMERSET. PROSPECT OPENING.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 9142 (p. 65).

Mine.—Prospect opening in the Coal Creek district, 14 miles southeast of Somerset, in sec. 27 T. 14 S., R. 89 W.

Coal bed.—No. 5. Cretaceous age, in the Bowie member of the Mesaverde formation.

The bed was measured and sampled by W. T. Lee on August 14, 1909, as described below.

Section of coal bed in prospect opening, 14 miles southeast of Somerset.

Laboratory No.	9142	
Roof, sandstone.	*Ft.*	*in.*
Coal	3	10
Coal, bony [a]	1	0
Coal	1	2
Floor, shale.		
Thickness of bed	6	0
Thickness of coal sampled	5	0

[a] Not included in sample.

Note.—The sample was collected from a freshly cleared face in the prospect opening, 25 feet from surface.

For chemical analyses of this coal see part I of this bulletin, p. 65.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

SOMERSET. PROSPECT OPENING.

Sample.—Semibituminous coal; Grand Mesa field; analysis No. 8800 (p. 65).

Mine.—Prospect opening in Coal Creek district, 14 miles southeast of Somerset, in sec. 27, T. 14 S., R. 89 W.

Coal bed.—No. 2. Cretaceous age, in the Bowie member of the Mesaverde formation.

The bed was measured and sampled by W. T. Lee on August 10, 1909, as described below:

Section of coal bed No. 2 of prospect opening, 14 miles southeast of Somerset.

Laboratory No	8800	
Roof, shale.	*Ft.*	*in.*
Coal	0	11
Shale [a]	0	5
Coal	3	0
Bone [a]	0	5
Coal	0	9
Bone [a]	0	6
Coal	1	1
Floor, shale.		
Thickness of bed	7	1
Thickness of coal sampled	5	9

[a] Not included in sample.

Note.—The sample was collected at the outcrop.

For chemical analyses of this coal see part I of this bulletin, p. 65.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

SOMERSET. PROSPECT OPENING.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 9140 (p. 65).

Mine.—Prospect opening in the Coal Creek district, in sec. 34, T. 14 S., R. 89 W., about 15 miles southeast of Somerset.

Coal bed.—Not named. Cretaceous age, in the Bowie member of the Mesaverde formation.

The bed was measured and sampled by W. T. Lee, August 13, 1909, the sample representing 2 feet 4 inches of coal.

Note.—The sample was collected at the outcrop and included the entire bed.

For chemical analyses of this coal see part I of this bulletin, p. 65.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

SOMERSET. MOSELY'S PROSPECT.

Sample.—Semibituminous (?) coal; Grand Mesa field; analysis No. 9141 (p. 65).

Mine.—Mosely's prospect; a drift entry located in the Coal Creek district, in the east wall of the upper Coal Creek Canyon about 16 miles southeast of Somerset, in sec. 9, T. 15 S., R. 89 W.

Coal bed.—The coal is of Cretaceous age and is known as coal No. 6 in this district. It is in the Bowie member of the Mesaverde formation. The bed was measured and sampled by W. T. Lee on August 13, 1909, as described below:

Section of coal bed No. 6 of Mosely's prospect, 16 miles southeast of Somerset.

Laboratory No	9141	
Roof, shale.	*Ft.*	*in.*
Shale, carbonaceous [a]	1	3
Coal	3	4
Shale, carbonaceous [a]	0	9
Coal	3	4
Floor, shale.		
Thickness of bed	8	8
Thickness of coal sampled	6	8

[a] Not included in sample.

Note.—The sample was collected from a freshly cleared face 40 feet from the mouth of the entry.

For chemical analyses of this coal see part I of this bulletin, p. 65.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 320.

HUERFANO COUNTY.

LA VETA. OAKDALE MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6608 (p. 65).

Mine.—Oakdale; in the NW. ¼ SW. ¼ sec. 10, T. 29 S., R. 69 W., 6 miles northwest of La Veta.

Coal bed.—Not named. Upper Cretaceous age, in the Vermejo[a] formation. Thickness, about 7 feet 6 inches. The bed lies about 30 feet above the Trinidad sandstone.

The bed was measured and sampled by G. B. Richardson on October 1, 1908. The sample represented 7 feet 4 inches of clean coal.

The sample was taken from the face of south entry 3.

For chemical analyses of this coal see part I of this bulletin, p. 65; also U. S. Geol. Survey Bull. 381, p. 432.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

McGUIRE. PINON MINE.

Sample.—Bituminous coal; Trinidad field; analyses Nos. 10189, 10190 (p. 65).

Mine.—Pinon; in sec. 23, T. 27 S., R. 67 W., at McGuire, 9 miles from Walsenburg.

Coal bed.—Cameron. Cretaceous age, Vermejo formation.

The bed was measured and sampled at two points on March 25, 1910, by G. T. Peart, as shown below:

Sections of coal bed in Piñon mine, at McGuire.

Laboratory No.	10189		10190	
	Ft.	*in.*	*Ft.*	*in.*
Top coal	2	0	1	1
Shale, bony	[a]1	6	[a]0	3
Coal	3	2	2	2
Shale, bony	..	..	[a]0	5
Coal	..	..	1	6
Thickness of bed	6	8	5	5
Thickness of coal sampled	5	2	4	9

[a] Not included in sample.

Sample 10189 was taken from south entry 4, 1,700 feet from portal.

Sample 10190 was taken from south entry 1, 1,400 feet from portal.

The samples were taken according to the standard method of the Bureau of Mines, but the collector was not connected with the Bureau of Mines nor with the United States Geological Survey.

For chemical analyses of this coal see part I of this bulletin, p. 65.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

PRYOR. PRYOR MINE.

Sample.—Bituminous coal; Trinidad field; analyses Nos. 6540, 6541 (p. 65).

Mine.—Pryor; in NE. ¼ sec. 24, T. 29 S., R. 66 W., at Pryor.

Coal bed.—Pryor and Cameron. The coal is of Cretaceous age, Vermejo formation. The rock lies almost flat.

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[a] The coal-bearing rocks of the Raton Mesa region, which includes the Raton coal field in New Mexico and the Trinidad field in Colorado, were formerly placed in the Laramie formation, but it is now known that they are separated by an unconformity into two formations. The United States Geological Survey has named the older formation, which is of Montana-Cretaceous age, the Vermejo formation, and the younger one, which is of Cretaceous or Tertiary age, the Raton formation. Inasmuch as the coal measures near Canyon City are correlated with the Vermejo bed, that name is used also for the Canyon City field.

The beds were measured and sampled by G. B. Richardson on September 14, 1909, as described below:

Section of lowest coal bed (Cameron) in Pryor mine, at Pryor.

Laboratory No	6540	
	Ft.	*in.*
Coal, bony[a]	0	3
Coal	1	6½
Coal, bony[a]	0	1
Coal	2	5
Coal, bony[a]	0	6
Thickness of bed	4	9½
Thickness of coal sampled	3	11½

[a] Not included in sample.

Section of middle coal bed (Pryor) in Pryor mine, at Pryor.

Laboratory No	6541	
	Ft.	*in.*
Coal, bony[a]	0	9
Coal	0	5
Shale[a]	0	2½
Coal	4	3
Thickness of bed	5	7½
Thickness of coal sampled	4	8

[a] Not included in sample.

Sample 6540 was taken from face of north entry 3.

Sample 6541 was taken from south entry 2, 150 feet from bottom of slope.

For chemical analyses of this coal see part I of this bulletin, p. 65; also U. S. Geol. Survey Bull. 381, p. 432.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

ROUSE. WALSEN MINE.

Sample.—Natural coke and bituminous coal; Trinidad field; analyses Nos. 6529, 6531, 6532, 6535 (p. 65).

Mine.—Walsen; Walsenburg district; a slope mine in the NE. ¼ sec. 30, T. 29 S., R. 65 W., at Rouse.

Coal bed.—Rouse. The coal is of Cretaceous age, in the Vermejo formation. The rock lies almost flat.

The bed was measured and sampled in the summer of 1908 by O. J. Bowman, as described below:

Sections of coal bed in Walsen mine, at Rouse.

Laboratory No	6529		6532		6535	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	0	2	6	2	0
Shale, sandy[a]	0	2½	..	..	..	..
Sandstone, shaly[a]	..	..	0	4½	0	2½
Coal	3	3	3	3½	3	3
Thickness of bed	5	5½	6	2	5	5½
Thickness of coal sampled	5	3	5	9½	4	3

[a] Not included in sample.

Sample 6529 was taken in entry 4, 15 feet from dike.

Sample 6531 was taken in east entry 4, main slope, 1 foot from natural coke and 2½ feet from dike.

Sample 6532 was taken from face of east entry 8, near base of main slope.

Sample 6535 was taken in east entry 4, close to small dike and natural coke.

For chemical analyses of this coal see part I of this bulletin, p. 65; also U. S. Geol. Survey Bull. 381, pp. 432, 435.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

SHUMWAY. PINON NO. 3 MINE.

Sample.—Bituminous coal; Trinidad field (Denver No. 6); analyses Nos. 222-D, 223-D (p. 66).

Mine.—Pinon No. 3, a shaft mine in sec. 23, T. 27 S., R. 67 W., at Shumway, on the Denver & Rio Grande Railroad.

Coal bed.—Locally known as the Lower bed. Cretaceous age, in the Vermejo formation. Thickness fairly uniform, averaging 5 to 5½ feet; roof, shale; floor, shale. A higher bed, also worked at this mine, lies 140 feet above this bed.

The bed was measured and sampled at two points by J. W. Groves on January 3, 1908, as shown below:

Sections of coal bed in Pinon No. 3 mine, at Shumway.

Section	A		B	
Laboratory No	223-D		222-D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3½	1	3
Shale [a]	0	2½	0	2½
Coal	2	4	2	3
Shale [a]	0	1	0	1
Coal	1	8	1	7
Floor, shale.				
Thickness of bed	5	7	5	4½
Thickness of coal sampled	5	3½	5	1

[a] Not included in sample.

Section A (sample 223-D) was measured 500 feet northwest of the shaft; section B (sample 222-D), 560 feet southwest of the shaft.

For results of tests of this coal see mention of specific tests as follows: Washing tests, U. S. Geol. Survey Bull. 368, p. 27; coking tests, U. S. Geol. Survey Bull. 368, p. 41.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 368, p. 16.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

STRONG. SUNNYSIDE MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6551 (p. 66).

Mine.—Sunnyside; in the SW. ¼ NW. ¼ sec. 9, T. 27 S., R. 67 W., at Strong.

Coal bed.—The coal occurs in the Vermejo (?) formation.

The bed was measured and sampled by G. B. Richardson on September 24, 1908, as shown below:

Section of coal bed in Sunnyside mine at Strong.

Laboratory No	6551	
	Ft.	*in.*
Coal	5	5
Bone [a]	0	1
Coal	1	8
Thickness of bed	7	2
Thickness of coal sampled	7	1

[a] Not included in sample.

The sample was taken from face of main slope.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 381, p. 432.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

Walsenburg. Robinson Mine.

Sample.—Bituminous coal; Trinidad field; analysis No. 6547 (p. 66).

Mine.—Robinson; in the NE. ¼ NW. ¼ sec. 17, T. 28 S., R. 66 W., 1 mile west of Walsenburg.

Coal bed.—Robinson. Cretaceous age, in the Vermejo formation. The rocks lie almost flat; roof, shale; floor, shale.

The bed was measured and sampled by G. B. Richardson on September 22, 1908, the sample representing 7 feet of coal.

The sample was taken from cross entry 8, off north entry 8.

Note.—Output in 1910, 206,130 tons.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 381, p. 432.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

JEFFERSON COUNTY.

Golden. St. James (Ralston Creek) Mine.

Sample.—Subbituminous coal; Denver region; analysis No. 6372 (p. 66).

Mine.—St. James (Ralston Creek); 5 miles north of Golden, in sec. 33, T. 2 S., R. 70 W.

Coal bed.—The bed is of Cretaceous age, Laramie formation. Thickness, about 2 feet.

The bed was measured and sampled by G. C. Martin in 1908, the sample representing 2 feet of coal.

The sample was taken 500 feet north of opening and was dry and fresh.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

Morrison. Morrison Mine.

Sample.—Subbituminous coal; Denver region; analyses Nos. 6593, 6594 (p. 66).

Mine.—Morrison; 2 miles north of Morrison, in sec. 23, T. 4 S., R. 70 W.

Coal bed.—15-foot. Cretaceous age, Laramie formation. Thickness, about 15 feet.

The bed was measured and sampled by G. C. Martin on September 18, 1908, as shown below:

Sections of coal bed in Morrison mine, 2 miles north of Morrison.

Laboratory No.	6593		6594	
	Ft.	*in.*	*Ft.*	*in.*
Coal	[a]0	7	[a]0	7
Coal, bony	[a]0	5	[a]0	5
Coal	14	8	[a]10	11
Coal	..	..	3	9
Thickness of bed	15	8	15	8
Thickness of coal sampled	14	8	3	9

[a] Not included in sample.

Sample 6593 was taken 50 feet north of shaft on a 73-foot level, and was dry and fresh when taken.

Sample 6594 was taken at bottom of shaft on a 120-foot level, and was wet and fresh when taken.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

LA PLATA COUNTY.

BAYFIELD. WHEELER MINE.

Sample.—Bituminous coal; Durango field; analysis No. 2094 (p. 66).

Mine.—Wheeler; near Nelson ranch, at head of Beaver Creek, 10 miles from Bayfield, in T. 35 N., R. 6 W.

Coal bed.—The bed is of Cretaceous age, "Laramie" formation.

The bed was measured and sampled by F. C. Schrader in 1905, as shown below:

Section of coal bed in Wheeler mine, 10 miles from Bayfield.

Laboratory No	2094	
	Ft.	*in.*
Coal, bony [a]	1	2
Coal	2	8½
Coal, bony [a]	0	1
Coal	0	5
Thickness of bed	4	4½
Thickness coal sampled	3	1½

[a] Not included in sample.

The sample was taken 50 feet from opening.

For chemical analyses of this coal see part I of this bulletin, p. 66; also U. S. Geol. Survey Bull. 341, p. 363.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 352.

DURANGO. PROSPECT.

Sample.—Bituminous coal; Durango field; analysis No. 3994 (p. 67).

Mine.—Prospect; on Hay Gulch in sec. 36, T. 35 N., R. 12 W., 14 miles southwest of Durango.

Coal bed.—Not named. Upper Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1906 by J. A. Taff, as described below:

Section of coal bed in prospect 14 miles southwest of Durango.

Laboratory No	3994	
	Ft.	*in.*
Coal	1	0
Bone [a]	0	6
Coal	4	0
Thickness of bed	5	6
Thickness of coal sampled	5	0

[a] Not included in sample.

The sample was taken 20 feet in the drift.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 335.

DURANGO. GOLD KING CONSOLIDATED MINE.

Sample.—Bituminous coal; Durango field; analysis No. 4174 (p. 67).

Mine.—Gold King Consolidated; 1 mile east of Durango, in sec. 28, T. 35 N., R. 9 W. No railroad connection.

Thickness averages 2 feet 10 inches; roof, sandstone; floor, sandstone.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. Dips 18° SE.

The bed was sampled and measured by C. D. Smith on October 26, 1906, as shown below:

Section in Gold King Consolidated mine, 1 mile east of Durango.

Laboratory No	4174	
	Ft.	*in.*
Roof, sandstone.		
Coal	2	5
Shale [a]	0	2
Floor, sandstone.		
Thickness of bed	2	7
Thickness of coal sampled	2	5

[a] Not included in sample.

The sample was taken from the east entry on south side of main drift.

Note.—In 1906, the time of sampling, the mine supplied coal to Durango.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 326.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 329.

Durango. Gold Prince (or Champion) Mine.

Sample.—Bituminous coal; Durango field; analysis No. 4113 (p. 67).

Mine.—Gold Prince (or Champion), 1½ miles east of Durango, in the NE. ¼ sec. 6, T. 34½ N., R. 9 W. No railroad connection.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. Dip, 18° SE. The coal bed was measured and sampled on October 26, 1906, by C. D. Smith, the sample representing 3 feet 6 inches of coal. The sample was dry when taken.

The point of sampling is not given.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 326.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 330.

Durango. La Plata Mine.

Sample.—Subbituminous coal; Durango field; analysis No. 3551 (p. 67).

Mine.—La Plata; 3 miles southeast of Durango, in the SE. ¼ sec. 27, T. 35 N., R. 9 W.

Coal bed.—The bed is of Cretaceous age, near the base of the "Laramie" formation. Thickness, irregular; dip, 36° SE.; roof and floor, shale.

This bed was measured and sampled by M. K. Shaler in 1906 as follows:

Section of coal bed at La Plata mine 3 miles southeast of Durango.

Laboratory No	3551	
	Ft.	*in.*
Roof, shale.		
Coal	1	8
Sandstone, shaly [a]	0	3
Coal	3	2
Coal, bony [a]	0	3
Coal	0	7
Shale [a]	0	4
Coal	2	7
Floor, shale.		
Thickness of bed	8	10
Thickness of coal sampled	8	0

[a] Not included in sample.

The sample was taken from the upper drift.

Notes.—The La Plata mine was closed after a short period of operation.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 341, p. 363; Bull. 316, p. 326.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 326.

DURANGO. PROSPECT.

Sample.—Subbituminous coal; Durango field; analysis No. 8433 (p. 67).

Location.—Prospect; in sec. 19, T. 35 N., R. 8 W., 7 miles northeast of Durango.

Coal bed.—"A." Cretaceous age, "Laramie" formation. Thickness, inconstant; dip about 50° SE.; roof and floor shale.

A section and sample for analysis was taken 8 feet back in a shallow prospect at this location by J. H. Gardner in 1909, the section being as follows:

Section of coal bed in outcrop 7 miles northeast of Durango.

Laboratory No.	8433	
Roof, shale.	Ft.	in.
Bony coal[a]	1	0
Coal[a]	0	4
Bony coal[a]	0	4
Coal	2	6
Bony coal[a]	0	3
Shale[a]	0	4
Bony coal[a]	0	8
Shale, coaly[a]	0	11
Coal, bony[a]	1	1
Floor, shale.		
Thickness of bed	7	5
Thickness of coal sampled	2	6

[a] Not included in sample.

Notes.—This coal is subbituminous and readily slacks on exposure to air.

For chemical analysis of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 471, p. 637.

DURANGO. OUTCROP.

Sample.—Subbituminous coal; Durango field; analysis No. 8431 (p. 67).

Location.—Outcrop in sec. 19, T. 35 N., R. 8 W., about 7 miles east of Durango.

Coal bed.—B. Cretaceous age, "Laramie" formation. Thickness inconstant, with numerous thin shale partings; dip, about 50° SE.; roof and floor, shale.

The bed was measured and sampled in 1909 by J. H. Gardner, the section being as follows:

Section of coal bed in outcrop 7 miles east of Durango.

Laboratory No.	8431	
Roof, shale.	Ft.	in.
Coal, thinly laminated with shale and bone[a]	8	4
Coal	4	0
Floor, shale.		
Thickness of bed	12	4
Thickness of coal sampled	4	0

[a] Not included in sample.

The sample was taken 30 feet back in the outcrop.

Notes.—This coal is of the subbituminous class and will not withstand rough handling. It slacks readily on exposure. Some coal has been mined at this prospect for local demand in winter.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 471, p. 637.

DURANGO. PROSPECT.

Sample.—Subbituminous coal; Durango field; analysis No. 8432 (p. 67).

Location.—Prospect; in the SW. ¼ SW. ¼ sec. 19, T. 35 N., R. 8 W., about 8 miles east of Durango.

Coal bed.—"C." Cretaceous age, "Laramie" formation. Thickness, inconstant, contains a notable percentage of shale and bone coal; dip, about 50° SE.; roof and floor, shale. A section and sample for analysis was taken by J. H. Gardner in 1909 as shown below.

Section of coal bed in prospect 8 miles east of Durango.

Laboratory No	8432	
	Ft.	*in.*
Roof, shale.		
Bony coal [a]	1	1
Shale [a]	0	½
Coal	1	9
Coal, bony [a]	1	0
Floor, shale.		
Thickness of bed	3	10½
Thickness of coal sampled	1	9

[a] Not included in sample.

The sample was taken in a shallow prospect 30 feet back from the mouth.

Notes.—This coal is of the subbituminous class and readily slacks on exposure to air.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 471.

DURANGO. PALMER MINE.

Sample.—Subbituminous coal; Durango field; analysis No. 9146 (p. 67).

Mine.—Palmer, in the SE. ¼ NW. ¼ sec. 15, T. 35 N., R. 6 W., 19 miles east of Durango.

Coal bed.—B. Cretaceous age, "Laramie" formation. Thickness, inconstant; roof and floor, shale; dip over 50° S.

The bed was measured and sampled in 1909 by J. H. Gardner, the sample representing 8 feet of coal.

The sample was taken 220 feet down entry.

Notes.—Some coal has been mined here for local use among farmers in the winter months. The coal is of the subbituminous class and slacks readily on exposure to air.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 471.

HESPERUS. HESPERUS MINE.

Sample.—Bituminous coal; Durango field; analyses Nos. 3573, 3950, (p. 67).

Mine.—Hesperus; in sec. 14, T. 35 N., R. 11 W., ¼ mile southwest of Hesperus, on the Rio Grande Southern Railroad.

Coal bed.—Hesperus. The coal is of Cretaceous age, Mesaverde formation, belonging to the same group of coal beds as those mined at Perins Peak (see description of analysis No. 3552) and Porter (see description of analyses Nos. 3995, 3996, 3997). Thickness of bed, 4 feet 10 inches to 6 feet 6 inches; dip, about 7° S.

The bed was measured and sampled by M. K. Shaler (No. 3573) and C. D. Smith (No.3950) in 1906 as described below:

Sections of coal bed in Hesperus mine ¼ mile southwest of Hesperus.

Laboratory Nos	3573		3950	
	Ft.	*in.*	*Ft.*	*in.*
Coal	3	10	3	10
Bone [a]	0	¼	0	¼
Coal	1	6	1	6
Coal, bony, variable [a]	1	3	1	3
Thickness of bed	6	7¼	6	7¼
Thickness coal sampled	5	4	5	4

[a] Not included in sample.

Sample 3573 was taken in entry 1 west of slope.

Sample 3950 was taken from west level 3 on the main slope.

Notes.—This coal is a good-grade bituminous coal but up to 1906 had not been successfully coked as have the beds in the same formation at Perins Peak and Porter. It is considered an excellent coal for locomotive and domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, pp. 334, 386.

PERINS. PERINS PEAK MINE.

Sample.—Bituminous coal; Durango field; analysis No. 3552 (p. 67).

Mine.—Perins Peak; at Perins, 4 miles northwest of Durango, in sec. 14, T. 35 N., R. 10 W., on a branch of the Rio Grande Western Railway.

Coal bed.—The bed is of Cretaceous age, Mesaverde formation. Roof, shale 1 to 2 feet thick, and requires careful timbering; floor, sandstone, 2 feet 6 inches to 7 feet; in places a 5-inch shale parting appears near the base of the bed.

The bed was measured and sampled by C. D. Smith on September 21, 1906, as shown below:

Section of coal bed in Perins Peak mine at Perins.

Laboratory No.	3552	
Roof, shale.	*Ft.*	*in.*
Coal	6	10¾
Shale [a]	0	8
Coal [a]	0	3½
Floor, sandstone.		
Thickness of bed	7	10¼
Thickness of coal sampled	6	10¾

[a] Not included in sample.

The sample was taken 1,200 feet from the mouth of the mine.

Notes.—The coal is mined on a rise toward the northeast. It is a high-grade bituminous coal and is considered excellent fuel for locomotive and domestic use. It is also a coking coal, and in 1906 a large portion of the output was used for coke by the smelters of metallic ores in the San Juan region of southwest Colorado. This bed belongs to the same group of coals as the beds mined at Porter and Hesperus, Colo.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423; Bull. 341, p. 363.

PORTER. PORTER NO. 3 MINE.

Sample.—Bituminous (coking) coal; Durango field; analyses Nos. 2092, 2093, 3997, (p. 67).

Mine.—Porter No. 3; 4 miles southwest of Durango, at Porter, in the NW. ¼ sec. 35, T. 35 N., R. 10 W., on Rio Grande Southern Railway.

Coal bed.—No. 3. Cretaceous age, Mesaverde formation. Thickness, uniform; dip about 8° SE.

Two samples, A and B, were obtained from the bed on August 30, 1905, by M. R. Campbell. Sample A (analysis No. 2092) represented 3 feet of coal; sample B (analysis No. 2093) represented 2 feet 9 inches of coal.

Sample A was taken in first dip off south side of main entry, 1,500 feet from mouth of mine.

Sample B was taken in main heading, 2,000 feet from mouth of mine.

The bed was also measured and sampled by J. A. Taff on September 18, 1906, as shown below:

Section of coal bed in Porter No. 3 mine at Porter.

Laboratory No	3997	
	Ft.	*in.*
Coal [a]	0	10
Shale [a]	1	0
Coal [a]	4	0
Bone [a]	0	2
Coal	2	7½
Thickness of bed	8	7½
Thickness of coal sampled	2	7½

[a] Not included in sample.

Sample 3997 was taken in main entry, 1,250 feet north of mine mouth.

Notes.—In 1905, at the time of sampling, lump coal from this mine was sold for steam and domestic use. The fine coal was coked at Durango.

For chemical analyses see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 285, p. 243; also Bull. 316, p. 331.

PORTER. PORTER NO. 1 MINE.

Sample.—Bituminous coal; Durango field; analysis No. 3995 (p. 67).

Mine.—Porter No. 1; at Porter, in the SE. ¼ sec. 34, T. 35 N., R. 10 W., on the Rio Grande Southern Railway.

Coal bed.—No. 1. Upper Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 18, 1906, by J. A. Taff, the sample representing 2 feet 4 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423.

PORTER. PORTER NO. 2 MINE.

Sample.—Bituminous coal; Durango field; analysis No. 3996 (p. 68).

Mine.—Porter No. 2; at Porter, in sec. 34, T. 35 N., R. 10 W., on the Rio Grande Southern Railroad.

Coal bed.—No. 2. Upper Cretaceous age, Mesaverde formation. Thickness, regular; dip, about 8° SE.

The bed was measured and sampled on September 18, 1906, by J. A. Taff, as shown below:

Section of coal bed in Porter No. 2 mine at Porter.

Laboratory No	3996	
	Ft.	*in.*
Coal	1	1½
Bone [a]	0	9
Coal	2	6
Thickness of bed	4	4½
Thickness of coal sampled	3	7½

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 67; also U. S. Geol. Survey Bull. 316, p. 423.

PORTER. PRUITT MINE.

Sample.—Subbituminous coal; Durango field; analysis No. 3639 (p. 68).

Mine.—Pruitt, 15 miles southwest of Porter, 5 miles northeast of Pendleton, N. Mex., 25 feet north of the State line, in the NW. ¼ SW. ¼ sec. 23, T. 32 N., R. 12 W. No railroad connection.

Coal bed.—Carbonero. Cretaceous age, "Laramie" formation. The bed is exceptionally thick and contains numerous bony layers and thin shale partings. The mine is a chamber 25 feet wide, 100 feet long, and high enough for wagons to enter and load direct from the working face.

The bed was sampled and measured on August 18, 1906, by M. K. Shaler, as shown below:

Section of coal bed in Pruitt mine, 15 miles southwest of Porter.

Laboratory No		3639	
		Ft.	*in.*
Coal		1	0
Sandstone		0	¼
Coal		1	6
Sandstone		0	¼
Coal		3	6
Shale		0	½
Coal		1	6
Coal, bony		0	1
Coal		2	0
Sandstone		0	1
Coal		2	0
Sandstone		0	½
Coal		1	6
Shale		0	2
Coal		5	0
"Rash"		0	2
Coal		2	0
Coal, sandy, bony		0	1
Coal	[b]	0	10
Bone		0	¼
Coal		1	0
Coal, sandy, bony		0	4
Coal		0	7
Coal, sandy, bony		0	1
Coal[a]		4	10
"Rash"		0	10
Coal		1	7
Shale		0	6
Coal		5	0
Thickness of bed		36	3½
Thickness of coal sampled		4	10

[a] Sampled.

[b] Part mined.

The sample was taken 25 feet from outcrop on the State line.

Notes.—The sample is a subbituminous coal, rather high in ash. The mine was operated in order to supply a small local demand each winter. The portion sampled is a clean bench and is probably lower in ash than the bed taken as a whole. The coal slacks when exposed to the air and breaks in mining.

For chemical analyses of this coal see part I of this bulletin, p. 68; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 395.

LARIMER COUNTY.

DIXON. INDIAN SPRINGS MINE.

Sample.—Subbituminous coal; Denver region: analysis No. 6433 (p. 68).

Mine.—Indian Springs; 6 miles northeast of Dixon, in sec. 24, T. 10 N., R. 68 W.

Coal bed.—The coal is of Cretaceous age, Laramie formation. Thickness, 6 feet 2 inches.

The bed was measured and sampled by G. C. Martin on August 26, 1908, as shown below:

Section of coal bed in Indian Springs mine. 6 miles northeast of Dixon.

Laboratory No	6433	
	Ft.	*in.*
Coal	5	1
Bone[a]	1	1
Thickness of bed	6	2
Thickness of coal sampled	5	1

[a] Not included in sample.

The sample was taken 700 feet north and 70 feet east, on main entry. It was dry and probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 68; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

LAS ANIMAS COUNTY.

AGUILAR. LAS ANIMAS NO. 4 MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6536 (p. 68).

Mine.—Las Animas No. 4; in the NE. ¼ sec. 20, T. 30 S., R. 65 W., 2 miles northwest of Aguilar.

Coal bed.—Broadhead No. 4. Cretaceous age, Vermejo (?) formation. The rocks lie almost flat.

The bed was measured and sampled by G. B. Richardson on September 10, 1908. The sample represented 4 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 68; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

AGUILAR. PEERLESS-ANNEX MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6528 (p. 68).

Mine.—Peerless-Annex; in the NW. ¼ sec. 34, T. 30 S., R. 65 W., 1 mile southwest of Aguilar.

Coal bed.—Peerless. Cretaceous age, Vermejo formation. The rocks lie almost flat.

The bed was measured and sampled by G. B. Richardson on September 10, 1908, the sample representing 4 feet of coal.

The sample was taken from room 1, north entry.

For chemical analyses of this coal see part I of this bulletin, p. 68; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

BERWIND. BERWIND NO. 3 MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6456 (p. 68).

Mine.—Berwind No. 3; in the NE. ¼ NE. ¼ sec. 36, T. 31 S., R. 65 W., at Berwind.

Coal bed.—Berwind. Cretaceous age, in the Vermejo formation. The rocks lie almost flat.

The bed was measured and sampled by G. B. Richardson on September 3, 1908, as shown below:

Section of coal bed at Berwind No. 3 mine at Berwind.

Laboratory No.	6456
	Ft. in.
Coal	0 4
Bony coal	1 2
Coal	4 4
Thickness of bed	5 10
Thickness of coal sampled	4 6

The sample was taken from the face of south entry 2, off east entry 14.

For chemical analyses of this coal see part I of this bulletin, p. 68; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

BERWIND. TOLLER MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 27) analysis No. 796–D. (p. 68).

Mine.—Toller; a shaft mine 1 mile west of Berwind, on the Colorado & Southern Railroad.

Coal bed.—Berwind. Cretaceous age, in the Vermejo (?) formation. Thickness, fairly uniform; roof, bone coal; floor, sandstone.

The bed was measured and sampled by K. M. Way on November 11, 1908. The sample represented 5 feet 11½ inches of coal. It was measured 180 feet southwest of the shaft.

For chemical analyses of this coal see part I of this bulletin, p. 68; also Bureau of Mines Bull. 5, p. 21.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

BOWEN. SUFFIELD MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 17) analyses Nos. 480–D, 481–D (p. 69).

Mine.—Suffield; a drift mine 1 mile north of Bowen, on the Colorado & Southern Railroad.

Coal bed.—Walsen. Cretaceous age, Vermejo formation. Thickness, fairly uniform.

The bed was measured and sampled at two points by J. W. Groves on August 19, 1908, as described below:

Section of coal bed in Suffield mine, 1 mile north of Bowen.

Section	A		B	
Laboratory No	480–D		481–D	
	Ft.	*in.*	*Ft.*	*in.*
Coal	3	0	0	11
Bone coal [a]	0	3	0	6
Coal	1	10	2	6
Bone coal [a]	..	..	0	2
Coal	..	..	0	11
Thickness of coal bed	5	1	5	0
Thickness of coal sampled	4	10	4	4

[a] Not included in sample.

Section A (sample 480–D) was measured 2,000 feet north of the drift opening.

Section B (sample 481–D) was measured 2,600 feet northwest of the drift opening.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 43.

For chemical analyses see part I of this bulletin, p. 69. Bureau of Mines Bull. 5, p. 12.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

COKEDALE. COKEDALE MINE.

Sample.—Natural coke and bituminous coal; Trinidad field; analyses Nos. 6313, 6321, 6367 (p. 69).

Mine.—Cokedale; Trinidad district; a drift mine in sec. 25, T. 33 S., R. 65 W., at Cokedale, connected with the Colorado & Wyoming Railroad.

Coal bed.—The coal is of Cretaceous age, Vermejo formation, about 220 feet above the Trinidad sandstone. The strata lie almost flat in the vicinity of Cokedale. The coal is of variable thickness. Roof and floor are hard black shale.

The bed was measured and sampled on July 27, 1908, by G. B. Richardson as described below:

Sections of coal bed in Cokedale mine at Cokedale.

Laboratory No.	6313		6321	
Roof, hard black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, bony [a]	..	..	0	5½
Coal	0	6	1	2
Bony coal [a]	0	3	0	4
Coal	0	5	0	8
Bony coal [a]	0	3½	0	2½
Coal	0	6½	0	11
Bony coal [a]	0	1½	0	2
Coal	2	4	0	4½
Bony coal [a]	0	3½	..	..
Shale [a]	..	..	0	4
Coal	1	3½	1	6
Bony coal [a]	0	3	..	..
Shale [a]	..	..	0	4
Coal	..	..	0	10
Bony coal [a]	..	..	0	3½
Floor, hard black shale.				
Thickness of bed	6	3½	7	7
Thickness of coal sampled	5	1½	5	5½

[a] Not included in sample.

Sample 6313 was taken in room 16, east entry 3.

Sample 6321 was taken in room 26, west entry 4.

Sample 6367 was specimen of natural coke, procured from bed at Cokedale.

For chemical analyses of this coal see part I of this bulletin, p. 69; also U. S. Geol. Survey Bull. 381, pp. 399, 430.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

Delagua. Delagua No. 2 Mine.

Sample.—Bituminous coal; Trinidad field. (Denver No. 4) analyses Nos. 113–D, 114–D (p. 69).

Mine.—Delagua No. 2, a drift mine at Delagua, on the Colorado & Southern Railway.

Coal bed.—The bed is of Cretaceous or Tertiary age, in the Raton formation. Thickness, fairly uniform; roof, shale; floor, bony coal.

The bed was measured and sampled at two points by W. J. Groves on November 12, 1907. The sections are as follows:

Sections of coal bed in Delagua No. 2 mine at Delagua.

Section	*A*		B	
Laboratory No.	113–D		114–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	6	0	3
Coal	1	10	2	0
Coal and pyrites	..	..	0	1½
Gray coal	0	¾	..	..
Coal	1	5	0	10
Bone	0	1	..	..
Coal and pyrites [a]	..	..	0	2
Coal	2	½	2	6
Floor, bone coal.				
Thickness of bed	5	11¼	5	10½
Thickness of coal sampled	5	5¼	5	5½

[a] Not included in sample.

Section A (sample 113–D) was measured 5,200 feet north of the drift opening; Section B (sample 114–D) was taken 7,000 feet north of the opening.

For results of tests of this coal, see mention of specific tests as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 368, p. 39.

For chemical analyses, see part I of this bulletin, p. 69; also U. S. Geol. Survey Bull. 368, p. 14.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

ENGLEVILLE. ENGLE MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 1) analyses Nos. 103–D, 104–D (p. 69).

Mine.—Engle; a drift mine at Engleville, 3 miles east of Trinidad, Colo., on the Denver & Rio Grande.

Coal bed.—The bed is of Cretaceous age, Vermejo formation. Roof, sandstone; floor, shale.

The bed was measured and sampled at two points by J. W. Groves in 1907, as described below.

Sections of coal bed in Engle mine at Engleville.

Section	A		B	
Laboratory No.	103–D		104–D	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Bone	0	2	..	..
Coal	2	0	0	8
Bone	0	2½	..	..
Shale [a]	..	..	0	2
Coal	2	6	1	10
Bone	0	2	0	3½
Coal	2	2	0	8
Bone [a]	..	..	0	3
Coal	..	..	0	11
Bone [a]	..	..	0	2½
Coal	..	..	1	7
Bone [a]	..	..	0	1
Coal	..	..	0	6
Floor, shale.				
Thickness of bed	7	2½	7	2
Thickness of coal sampled	7	2½	6	2

[a] Not included in sample.

Section A (sample 103–D) was measured 5,280 feet south of the opening, and section B (sample 104–D) was taken 10,000 feet east of the opening.

For results of tests of this coal, see mention of specific tests as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 368, p. 36.

For chemical analyses see part I of this bulletin, p. 69; also U. S. Geol. Survey Bull. 368, p. 11.

For a description of the geological relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

HASTINGS. HASTINGS MINE.

Sample.—Bituminous coal; Raton Mesa field; (Denver No. 10) analyses Nos. 254–D, 255–D (p. 69).

Mine.—Hastings; a slope mine in the Trinidad district, at Hastings, on the Colorado & Southern Railroad.

Coal bed.—The bed is of Cretaceous age, Vermejo formation. Thickness, varies, roof, shale; floor, shale.

The bed was measured and sampled at two points by J. W. Groves, January 13, 1908; as described below:

Sections of coal bed in Hastings mine at Hastings.

Section	A		B	
Laboratory No.	254–D		255–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10	2	11
Hard coal	0	2		.
Pyrites [a]	..	..	0	¾
Coal	3	3	1	9
Bone [a]	..	..	1	3
Coal	..	..	1	9
Bone	..	..	0	1
Coal	..	..	1	4
Floor, shale.				
Thickness of bed	5	3	9	1¾
Thickness of coal sampled	5	3	7	10

[a] Not included in sample.

Section A (sample 255–D) was measured 4,600 feet south of the mine mouth.

Section B (sample 254–D) was measured 3,800 feet south of the mine mouth, room 1, south slope 3.

Notes.—The commercial grades produced in 1908 were run of mine, lump, nut, and slack; 1¼ and ¾ inch bar screens used. The screenings were washed and made into coke. The rated capacity of the mine in 1908 was 1,400 tons per day.

For results of tests of this coal, see mention of specific tests, as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 368, p. 45.

For chemical analyses see part I of this bulletin, p. 69; also U. S. Geol. Survey Bull. 368, p. 20.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

MORLEY. MORLEY MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 7196 (p. 69).

Mine.—Morley; a slope mine at Morley, on the Colorado Fuel and Iron Co. Railroad.

Coal bed.—Engleville; Cretaceous age, in the Vermejo formation. Roof, hard shale overlain with sandstone, with 2 feet of good coal above; floor, fire clay.

The bed was measured and sampled by K. M. Way on October 29, 1908, as shown below:

Section of coal bed in Morley mine at Morley.

Laboratory No.	7196	
	Ft.	*in.*
Roof, hard shale.		
Bone coal [a]	0	4
Coal	7	6
Floor, fire clay.		
Thickness of bed	7	10
Thickness of coal sampled	7	6

[a] Not included in sample.

The sample was taken in the face of the main slope, 1,500 feet south of the opening.

Notes.—The capacity of the mine in October, 1908, was 450 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 69.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

PRIMERO. PRIMERO MINE.

Sample.—Natural coke and bituminous coal; Trinidad field; analyses Nos. 483–D and 484–D (Denver 18) and analyses Nos. 6370, 6368 (p. 69).

Mine.—Primero; in the NE. ¼ sec. 26, T. 33 S., R. 66 W., at Primero, on the Colorado & Wyoming Railroad.

Coal bed.—Primero. Cretaceous or Tertiary age, in the Raton formation. The bed lies almost flat.

The bed was measured and sampled at two points by J. W. Groves, as described below:

Sections of coal bed in Primero mine at Primero.

Section	A		B	
Laboratory No.	483–D		484–D	
	Ft.	*in.*	*Ft.*	*in.*
Coal	[a] 0	5½	..	..
Bony coal	[a] 0	1½	[a] 0	7
Coal	1	4	0	6
Bony coal	[a] 0	1½	[a] 0	1½
Coal	1	2	0	10
Bony coal	[a] 0	1	0	½
Coal	4	1	5	1
Thickness of bed	7	4½	7	2
Thickness of coal sampled	6	7	6	5½

[a] Not included in sample.

The bed was also measured and sampled by G. B. Richardson on August 11, 1908, as described below:

Section of coal bed in Primero mine at Primero.

Laboratory No	6370	
	Ft.	*in.*
Coal	1	1
Sulphur, local [a]	0	½
Coal	1	4½
Coal, bony [a]	0	7
Coal	0	3
Sulphur coal [a]	0	1
Coal	0	4½
Sulphur [a]	0	½
Coal	2	7½
Sulphur [a]	0	1
Coal	1	11
Thickness of bed	8	5½
Thickness of coal sampled	7	7½

[a] Not included in sample.

Section A (No. 483–D) was measured 4,200 feet west of the drift opening.

Section B (No. 484–D) was measured in blind entry 4, 3,000 feet northwest of the drift opening.

Sample 6370 was taken from room 1, third butt entry A, off entry 9.

A sample (Lab. No. 6368) of natural coke was also taken from this mine, at a point contiguous to a dike, 200 feet from mouth of west entry, by G. B. Richardson on August 11, 1908.

For results of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 44.

For chemical analyses see part I of this bulletin, pp. 69–70; also U. S. Geol. Survey Bull. 381, p. 431; Bureau of Mines Bull. 5, pp. 13, 44.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 383.

PRIMROSE. PRIMROSE MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6530 (p. 70).

Mine.—Primrose, in the SE. ¼ NW. ¼ sec. 5, T. 30 S., R. 65 W., at Primrose, near Kipner.

Coal bed.—Cretaceous or Tertiary age, in the Raton formation. The rocks lie almost flat.

The bed was measured and sampled by G. B. Richardson in the summer of 1908, as shown below:

Section of coal bed in Primrose mine at Primrose.

Laboratory No	6530	
	Ft.	*in.*
Coal	0	11
Shale	0	1
Coal	3	4
Thickness of bed	4	4
Thickness of coal sampled	4	4

The sample was taken in room 3, off north entry 7½.

For chemical analyses of this coal see part I of this bulletin, p. 70; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

RUGBY. RAPSON MINE.

Sample.—Bituminous coal; Trinidad field; analyses Nos. 734-D and 735-D (Denver No. 25) and analysis No. 6533 (p. 70).

Mine.—Rapson; a drift mine in sec. 9, T. 30 S., R. 65 W., 4 miles north of Aguilar and 1½ miles southwest of Rugby, on the Colorado & Southern Railroad.

Coal bed.—Cameron. The coal is of Cretaceous age, in the Vermejo formation. Thickness, fairly uniform; roof, shale; floor, shale. The bed lies almost flat.

The bed was measured and sampled at two points by K. M. Way, as described below:

Sections of coal bed in Rapson mine, 1½ miles southeast of Rugby.

Section	A		B	
Laboratory No.	734-D		735-D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	1½	0	6¾
Mother coal	0	⅜	..	..
Bone coal[a]	..	..	0	1½
Coal	0	6½	0	5½
Bone coal[a]	0	1½	0	1¼
Coal	0	9½	0	3¾
Sulphur	0	¼	0	¼
Coal	0	7	1	11¼
Bone coal	0	1½	..	..
Coal	1	4¼	..	..
Floor, shale.				
Thickness of bed	3	8⅜	3	6¼
Thickness of coal sampled	3	6⅞	3	4½

[a] Not included in sample.

Section A (sample 734-D) was taken 250 feet north of the drift mouth, north entry 3.

Section B (sample 735-D) was taken 250 feet south of the drift mouth, south entry 3.

The bed was also measured and sampled at one point by G. B. Richardson on September 15, 1908, as described below:

Section of coal bed in Rapson mine, 1½ miles southeast of Rugby.

Laboratory No.	6533	
	Ft.	*in.*
Coal, bony[a]	0	5
Coal	1	11½
Coal, bony[a]	0	2
Coal	1	4
Thickness of bed	3	10½
Thickness of coal sampled	3	3½

[a] Not included in sample.

Sample 6533 was taken from the face of south entry 3.

Notes.—The rated capacity of the mine in 1908 was 200 tons per day. All coal over 2½ inches in size was designated lump; all over 1 inch but less than 2½ inches, nut; all under 1 inch, slack.

For results of tests of this coal see mention of specific tests, as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests Bureau of Mines Bull. 5, p. 50.

For chemical analyses see part I of this bulletin, p. 70; also U. S. Geol. Survey Bull. 381, p. 431; Bureau of Mines Bull. 5, p. 19.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 383.

SOPRIS. FRANCISCO MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 7) analyses Nos. 230-D, 231-D (p. 70).

Mine.—Francisco; a slope mine, at Sopris, on the Trinidad electric road.

Coal bed.—Locally designated the Lower bed. Cretaceous age, Vermejo formation. Thickness, fairly uniform; roof, 4 inches of shale, in places underlain with a few inches of bony coal; floor, black shale. The bed was measured and sampled by J. W. Groves on January 4, 1908. The sections are:

Sections of coal bed in Francisco mine, at Sopris.

Section	A		B	
Laboratory No	230–D		231–D	
Roof: Section A, bone with shale; section B, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	11	..	..
Bony coal [a]	..	..	0	6
Bone [a]	0	1½	..	..
Coal	1	9	0	7
Shale [a]	..	..	0	1½
Coal	..	..	2	2
Floor: Section A, shale; section B, black shale.				
Thickness of bed	3	9½	3	4½
Thickness of coal sampled	3	8	2	9

[a] Not included in sample.

Section A (sample 230–D) was measured 1,200 feet southwest of the slope opening.

Section B (sample 231–D) was measured 3,000 feet west of the slope opening.

For results of tests of this coal, see mention of specific tests; as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests U. S. Geol. Survey Bull. 368, p. 42.

For chemical analyses see part I of this bulletin, p. 70; also U. S. Geol Survey Bull. 368, p. 17.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

SOPRIS. PIEDMONT MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 8) analyses Nos. 232–D and 233–D and analyses Nos. 10209, 10210, 10218 (p. 71).

Mine.—Piedmont; a slope mine in the Trinidad district, at Sopris, on the Colorado & Southern Railway.

Coal bed.—Locally called the Lower bed. Cretaceous age, Vermejo formation. Average thickness, about 4 feet; dip, about 10°; roof, shale; floor, "blackjack" and shale.

The bed was measured and sampled at two points by J. W. Groves on January 4, 1908, as described below:

Sections of coal bed in Piedmont mine, at Sopris.

Section	A		B	
Laboratory No	233–D		232–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4½	0	7½
Shale [a]	0	1½	0	1
Coal	1	0	0	9
Shale [a]	0	1	0	1½
Coal	1	5	3	2½
Bone	0	¾	..	..
Coal	0	8	..	..
Floor: Section A, shale; section B, "blackjack."				
Thickness of bed	3	8¾	4	9½
Thickness of coal sampled	3	6¼	4	7

[a] Not included in sample.

Section A (sample 233–D) was measured 2,600 feet southwest of the slope, in east entry 12.

Section B (sample 232–D) was measured 2,600 feet southeast of the slope, in west entry 9.

The bed was also measured and sampled at two points by William Morgan on March 27, 1910.

Sample 10210 was taken in the main slope, 2,000 feet south of opening, and represented a 3½-foot cut of coal.

Sample 10209 was taken 3,500 feet south of south entry, and represented a 5-foot 10-inch cut of clean coal.

Samples 10209 and 10210 were taken according to the standard method of the Bureau of Mines, but the collector was not connected with the Bureau of Mines nor with the United States Geological Survey.

Samples 10209 and 10210 were mixed for an ultimate analysis, the results of which are shown under laboratory No. 10218.

Notes.—In 1908 the coal produced was shipped as lump, nut, slack, and run-of-mine.

For results of tests of this coal see mention of specific tests, as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 368, p. 43.

For chemical analyses see part I of this bulletin, p. 71; also U. S. Geol. Survey Bull. 368, p. 18.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 383.

SOPRIS. SOPRIS MINE.

Sample.—Bituminous coal; Trinidad field; analyses Nos. 479–D and 485–D (Denver 16; Ann Arbor No. 6), and analyses No. 6310 (p. 71).

Mine.—Sopris; a slope mine in the NW. ¼ SE. ¼ sec. 33, T. 33 S., R. 64 W., at Sopris, on the Colorado & Southern Railroad.

Coal bed.—Cameron (often designated locally the Sopris). The coal is of Cretaceous age, Vermejo formation. Thickness, variable; roof, bone coal, shale, and sandstone; floor, shale.

The bed was measured and sampled at two points by K. M. Way and J. W. Groves on August 18, 1908, as described below:

Section of coal bed in Sopris mine at Sopris.

Section	A		B	
Laboratory No.	479–D		485–D	
Roof, bone coal, shale, and sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	11	..	..
Bony coal [a]	..	..	0	9½
Coal	..	..	1	2
Hard coal (good)	..	..	0	6
Coal	..	..	0	2
Bony coal [a]	..	..	0	1½
Coal	..	..	1	8
Floor, shale.				
Thickness of bed	3	11	4	5
Thickness of coal sampled	3	11	3	6

[a] Not included in sample.

Section A (sample 479–D) was measured 7,000 feet southwest of the slope.

Section B (sample 485–D) was measured 6,800 feet southeast of the slope.

The bed was also measured and sampled by G. B. Richardson in the summer of 1908, as shown below:

Section of coal bed in Sopris mine, at Sopris.

Laboratory No.	6310	
	Ft.	*in.*
Coal	0	3½
Coal, bony [a]	0	4½
Coal	0	9
Coal, bony [a]	0	1½
Coal	0	5½
Coal, bony [a]	0	1½
Coal	0	8
Coal, bony [a]	0	1
Coal	0	9
Thickness of bed	3	7½
Thickness of coal sampled	2	11

[a] Not included in sample.

The sample was taken from room 3, west entry 17.

Note.—In 1908 part of the output was used for making coke, and was washed before it went to the ovens.

For results of tests of this coal see mention of specific tests as follows: Washing tests, Bureau of Mines Bull. 5, p. 32; coking tests, Bureau of Mines Bull. 5, p. 42; illuminating-gas tests, Bureau of Mines Bull. 6, pp. 83, 47.

For chemical analyses, see part I of this bulletin, p. 71; also U. S. Geol. Survey Bull. 381, p. 430; Bureau of Mines Bull. 5, p. 11.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 383.

TERCIO. LAS VEGA MINE.

Sample.—Bituminous coal; Trinidad field; (Denver No. 3) analyses Nos. 101–D and 111–D and (Denver No. 2) analyses Nos. 102–D and 112–D (pp. 71, 72).

Mine.—Las Vega; slope and drift mines at Tercio, on the Colorado & Southern Railway (bed No. 3) and Colorado & Wyoming Railway (bed No. 2).

Coal beds.—Nos. 2 and 3. The coal is of Cretaceous age, Vermejo formation. Thickness, fairly uniform. Roof, for bed No. 3, shale, which in places is sandy; floor, shale; roof, for bed No. 2, shale; floor, shale and sandstone.

The beds were measured at two points each by J. W. Groves on November 8, 1907, as described below:

Sections of coal bed No. 2 in Las Vega mine at Tercio.

Section	A		B	
Laboratory No.	102–D		112–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	0
Bone	[a]0	2	[a]0	2½
Coal	1	11	2	0
Bone	[a]0	3	[a]0	3
Coal	2	6	2	8
Shale	[a]0	1	[a]0	1
Coal	0	10	0	10
Floor, shale for sec. A; for sec. B, shale and sandstone.				
Thickness of bed	6	9	7	½
Thickness of coal sampled	6	3	6	6

[a] Not included in sample.

Section A (sample 102–D) was taken 900 feet north of the slope opening.

Section B (sample 112–D) was taken 1,800 feet north of slope opening.

Sections of coal bed No. 3 in Las Vega mine at Tercio.

Section	A		B	
Laboratory No.	101–D		111–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3	1	2
Bone [a]	0	2	0	2
Coal	2	3	2	1
Floor shale.				
Thickness of bed	3	8	3	5
Thickness of coal sampled	3	6	3	3

[a] Not included in sample.

Section A (sample 101–D) was taken 800 feet north of slope opening.

Section B (sample 111–D) was taken 1,000 feet north of slope opening.

For results of tests of this coal see mention of specific tests as follows; Washing tests, U. S. Geol. Survey Bull. 368, p. 27.

For chemical analyses see part I of this bulletin, p. 72; also U. S. Geol. Survey Bull. 368, p. 12.

For geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

TRINIDAD. BOWEN MINE.

Sample.—Bituminous coal; Trinidad field; analysis No. 6458 (p. 72).

Mine.—Bowen, in the NE. ¼ SW. ¼ sec. 24, T. 32 S., R. 64 W., 5 miles north of Trinidad.

Coal bed.—The coal is in the Vermejo formation of Cretaceous age. The rocks lie almost flat.

The bed was measured and sampled by G. B. Richardson on September 3, 1908, as shown below:

Section of coal bed in Bowen mine, 5 miles north of Trinidad.

Laboratory No	6458	
	Ft.	*in.*
Coal	3	8½
Shale	0	½
Coal	1	0
Shale	0	1
Coal	0	10
Shale	0	3
Coal	1	1
Thickness of bed	7	0

The sample was taken from lowest bed, in room 11, north entry 2, off east entry 6.

For chemical analyses of this coal see part I of this bulletin, p. 72; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

TRINIDAD. PRIMERO MINE.

Sample.—Coal waste; Trinidad field; analysis No. 5151 (p. 72).

Mine.—Primero; in sec. 26, T. 33 S., R. 66 W., 14 miles west of Trinidad.

Coal bed.—Cretaceous or Tertiary age, in the Raton formation. The bottom of the bed was not mined.

The following sections were taken at different points in the mine by O. J. Bowman in the summer of 1907. The points of sampling were not definitely located by the collector.

Sections of coal bed in Primero mine, 14 miles west of Trinidad.

Section	A		B	
Laboratory No			5151	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	7	[a] 2	6
Slate	0	12	[a] 0	8
Coal	2	4	[a] 2	6
Slate	0	11	[a] 2	8
Coal	2	8	1	6
Floor, slate.				
Thickness of bed	9	6	2	10
Thickness of coal sampled	..	..	1	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 72.

TRINIDAD. SOPRIS MINE.

Sample.—Coal waste; Trinidad field; analysis No. 5152 (p. 72).

Coal bed.—Sopris. Cretaceous age, "Laramie" formation.

The top coal of the bed was not mined.

The sections following were taken at different points in the mine by O. J. Bowman in the summer of 1907. The points of sampling were not definitely located by the collector.

Sections of coal bed in Sopris mine, 5 miles southwest of Trinidad.

Section	A		B	
Laboratory No.			5152	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	0	2	2
Slate or bone	0	8	0	9
Coal	0	10	0	9
Sandstone	2	6	[a] 0	8
Slate or bone	0	6	[a] 0	6
Coal	4	0	[a] 4	3
Floor, slate.				
Thickness of bed	10	6	9	1
Thickness of coal sampled	..	..	3	8

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 72.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

Wildcat Creek. Clark's Prospect.

Sample.—Bituminous coal; Trinidad field; analysis No. 6455 (p. 72).

Mine.—Clark's Prospect, in the NE. ¼ sec. 18, T. 32 S., R. 68 W., 1 mile south of Wildcat Creek, north of Stonewall.

Coal bed.—The coal occurs in the Vermejo formation of Cretaceous age. The rocks dip eastward at a steep angle.

The bed was measured and sampled by G. B. Richardson on September 2, 1908. The sample represented 4 feet 11 inches of coal. It was taken 100 feet from opening.

For chemical analyses of this coal see part I of this bulletin, p. 72; also U. S. Geol. Survey Bull. 381, p. 431.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

Wootton. Red Robin Mine.

Sample.—Bituminous coal; Trinidad field; (Denver No. 11) analyses Nos. 257–D, 258–D (p. 72).

Mine.—Red Robin; a drift mine in the Trinidad district, at Wootton, on the Santa Fe Railroad.

Coal bed.—Often designated locally the Savage or Turner. Cretaceous or Tertiary age, in the Raton formation. Thickness, about 5 feet; roof, bone coal and shale; floor, shale.

The bed was measured and sampled at two points by J. W. Groves on January 20, 1908, as described below:

Sections of coal bed in Red Robin mine at Wootton.

Section	A		B	
Laboratory No.	257–D		258–D	
Roof, bone coal and shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	0
Shale [a]	0	1	..	..
Shale and coal [a]	..	..	0	1¼
Coal	1	10	2	10
Bone [a]	0	2	..	..
Shale and coal [a]	..	..	0	1
Coal	1	3	0	7
Shale [a]	0	1	0	1¼
Coal	0	4½	0	5
Floor: Sec. A, bone coal; sec. B, shale.				
Thickness of bed	4	9½	5	1½
Thickness of coal sampled	4	5½	4	10

[a] Not included in sample.

Section A (sample 257–D) was measured in west entry 2, 260 feet west of the entry.

Section B (sample 258–D) was measured in west entry 1, 275 feet west of the opening.

Notes.—When this mine was inspected it had been opened only a short time and had no direct railroad connection. The output was 40 tons per day, shipped as run-of-mine.

For results of tests of this coal see mention of specific tests, as follows: Washing tests, U. S. Geol. Survey Bull. 368, p. 27; coking tests, U. S. Geol. Survey Bull. 368, p. 46.

For chemical analyses see part I of this bulletin, p. 72; also U. S. Geol. Survey Bull. 368, p. 21.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 383.

MESA COUNTY.

Cameo. Bailey Mine.

Sample.—Bituminous coal; Grand Mesa field; analysis No. 5724 (p. 72).

Mine.—Bailey; Palisades district; prospect drift opening, 4 miles northeast of Palisades, near Cameo, in NW. ¼ SE. ¼ sec. 34, T. 10 S., R. 98 W., on the Denver & Rio Grande Railroad.

Coal bed.—Cameo. Cretaceous age, at the base of the Paonia shale member of the Mesaverde formation. Thickness, uniform; dip, slightly toward the northeast; roof, sandy shale, above which is impure coal; floor, shale.

The bed was measured and sampled by W. T. Lee on June 5, 1907. The sample represented 6 feet 2 inches of coal.

Notes.—The sample was collected from a working face 165 feet from the mouth of the entry, and included the entire bed. The coal from this bed is relatively soft and slacks to some extent on exposure to the weather.

For chemical analyses of this coal see part I of this bulletin, p. 72; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 319.

Cameo. Cameo Mine.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 3542, 3547, 3550, and (Denver 28) analyses Nos. 839–D, 840–D (p. 73).

Mine.—Cameo; a drift mine in the NW. ¼ NW. ¼ sec. 34, T. 10 S., R. 98 W., at Cameo, 4 miles northeast of Palisades.

Coal bed.—Cameo. The coal is of Cretaceous age, Mesaverde formation. The rocks dip low to the northeast. Floor, bone coal; roof, shale.

The bed was measured and sampled at two points by K. M. Way, as described below:

Sections of coal bed in Cameo mine at Cameo.

Section	A		B	
Laboratory No.	839–D		840–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10½	2	2½
Hard shale [a]	0	1	..	..
Shale [a]	..	..	0	¾
Coal	3	6	2	6
Shale and bone [a]	..	..	0	5
Coal	..	..	1	2¾
Floor, bone coal.				
Thickness of bed	5	5½	6	5
Thickness of coal sampled	5	4½	5	11¼

[a] Not included in sample.

Section A (sample 839-D) was measured 3,500 feet northwest of opening, slope entry.

Section B (sample 840-D) was measured 3,700 feet northwest of opening, west entry 1.

The bed was also measured and sampled at three points by G. B. Richardson on August 3, 1906, as described below:

Sections of coal bed in Cameo mine at Cameo.

Section	A		B		C	
Laboratory No	3550		3547		3542	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	4	2	0	2	2
Bony coal[a]	0	1	0	1	0	1
Coal	6	2	5	11	6	0
Thickness of bed	8	7	8	0	8	3
Thickness of coal sampled	8	6	7	11	8	2

[a] Not included in sample.

Sample 3550 was taken in room 5, off the main entry.

Sample 3547 was taken at the northwest end of the mine workings.

Sample 3542 was taken from the upper bed at the end of the main entry.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 53.

For chemical analyses see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44; Bureau of Mines Bull. 5, p. 22.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

FRUITA. NEARING MINE.

Sample.—Bituminous coal, Book Cliffs field; analysis No. 3586 (p. 73).

Mine.—Nearing; in the NE. ¼ sec. 30, T. 8 S., R. 101 W., 13 miles north of Fruita.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The sample represented 4 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

FRUITA. NUGENT MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3585 (p. 73).

Mine.—Nugent; in the NW. ¼ sec. 29, T. 8 S., R. 101 W., 12 miles north of Fruita.

Coal bed.—Lower. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The sample represented 4 feet 6 inches of coal. It was taken from the end of the main entry.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

FRUITA. KIEL OR GROSS MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3587 (p. 73).

Mine.—Kiel or Gross; in the SW. ¼ sec. 27, T. 8 S., R. 101 W., about 13 miles northeast of Fruita.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The sample represented 3 feet 6 inches of coal. It was taken from the end of the main entry.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 371, p. 44; Bull. 316, p. 316.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

FRUITA. LANE PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3584 (p. 73).

Location.—Lane prospect, about 13 miles north of Fruita, and 13 miles northeast of Mack, in the SW. ¼ sec. 18, T. 8 S., R. 101 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeastward.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in Lane prospect, 13 miles north of Fruita.

Laboratory No	3584	
	Ft.	*in.*
Coal	1	3
Bony coal [a]	0	4
Coal	3	0
Thickness of bed	4	7
Thickness of coal sampled	4	3

[a] Not included in sample.

The Palisades bed is known as the lower coal.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

FRUITA. TOMLINSON OR HUNTER MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3640 (p. 73).

Mine.—Tomlinson (or Hunter), northeast of Fruita, and 17 miles north of Grand Junction, in sec. 5, T. 9 S., R. 100 W.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. The rocks dip low to the northeast.

The bed was measured and sampled by G. B. Richardson on August 15, 1906, as shown below:

Section of coal bed in Tomlinson or Hunter mine, northeast of Fruita.

Laboratory No	3640	
	Ft.	*in.*
Coal	2	0
Bony coal [a]	0	4
Coal	4	5
Bone [a]	0	8
Coal	0	7
Thickness of bed	8	0
Thickness of coal sampled	7	0

[a] Not included in sample.

The Cameo bed is known as the upper coal.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

GRAND JUNCTION. PROSPECT.

Sample.—Bituminous coal; Gunnison Valley field; analysis No. 5530 (p. 73).

Mine.—Abandoned drift, in the Gunnison district, 1½ miles south of Grand Junction on the Denver & Rio Grande Railroad, in the SW. ¼ SW. ¼ sec. 26, T. 1 S., R. 1 W.

Coal bed.—No name. Cretaceous age, at the base of the Benton portion of the Mancos shale. Thickness, irregular; dip, slightly to the northwest; roof, shale, overlain with hard, flat sandstone; coal is underlain with shale, and bed is under cover of about 25 feet at point of sampling.

The bed was measured and sampled by W. T. Lee on June 17, 1907, as described below:

Section of coal bed in abandoned mine 1½ miles south of Grand Junction.

Laboratory No	5530	
Roof, shale.	*Ft.*	*in.*
Coal	1	6
Shale [a]	0	4
Coal	2	8
Floor, shale.		
Thickness of bed	4	6
Thickness of coal sampled	4	2

[a] Not included in sample.

Notes.—The sample was cut from a freshly cleared face in the main entry, 80 feet north from the mouth of the opening. The coal is relatively hard, but is "dead," probably because of weathering on account of the slight cover. The mine was shut down because good coal was obtained near Palisades, a few miles farther east.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 319.

GRAND JUNCTION. BOOK CLIFF MINE.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 3490, 3494, 3496, 3581 (pp. 73, 74).

Mine.—Book Cliff; in the SW. ¼ sec. 8, T. 10 S., R. 99 W., 11 miles northeast of Grand Junction and 10 miles northwest of Palisades.

Coal bed.—Cameo. The coal is of Cretaceous age, Mesaverde formation. The rock dips 25° to 30°.

The bed was measured and sampled at three points by G. B. Richardson on July 3, 1906, as described below:

Sections of coal bed in Book Cliff mine, 11 miles northeast of Grand Junction.

Section	A		B		C	
Laboratory Nos	3490		3496		3494	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	4	6	7	1	3	0
Bone	[a] 0	8	[a] 0	10	0	¼
Coal	3	4	0	6	4	6
Thickness of bed	8	6	8	5	7	6¼
Thickness of coal sampled	7	10	7	7	7	6¼

[a] Not included in sample.

Section A (sample 3490) was taken from the face of the northwest entry.

Section B (sample 3496) was taken from the face of the southeast entry.

Section C (sample 3494) was taken from the end of main entry.

Sample No. 3581, as measured, was reported to be 2 feet 6 inches thick, and was collected by the mine superintendent and represented the first coal below the Upper bed.

For chemical analyses of this coal see part I of this bulletin, p. 73; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

GRAND JUNCTION. STEEL MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3495 (p. 74).

Mine.—Steel; about 11 miles northeast of Grand Junction, in the NW. ¼ sec. 7, T. 10 S., R. 99 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in Steel mine, 11 miles northeast of Grand Junction.

Laboratory No	3495	
	Ft.	*in.*
Coal	1	0
Bony coal[a]	0	4
Coal	3	11
Thickness of bed	5	3
Thickness of coal sampled	4	11

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

GRAND JUNCTION. BLACK DIAMOND MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3493 (p. 74).

Mine.—Black Diamond; about 12 miles northeast of Grand Junction, in sec. 1, T. 10 S., R. 100 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in Black Diamond mine, 12 miles northeast of Grand Junction.

Laboratory No	3493	
	Ft.	*in.*
Coal	0	10
Clay[a]	0	2
Coal	4	8
Thickness of bed	5	8
Thickness of coal sampled	5	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

GRAND JUNCTION. BOB CAT MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3489 (p. 74).

Mine.—Bob Cat; about 12 miles northeast of Grand Junction, in sec. 36, T. 9 S., R. 100 W.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The thickness of the coal varied from 3 feet 8 inches to 4 feet 7 inches, being 4 feet at the place sampled.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

GRAND JUNCTION. EXCELSIOR MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3488 (p. 74).

Mine.—Excelsior; about 12 miles nearly north of Grand Junction, in sec. 35, T. 9 S., R. 100 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The bed dips low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The sample represented 4 feet 7 inches of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. PALISADES MINE.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 3541, 3539, 3549 (p. 74).

Mine.—Palisades; at Palisades in the SW. ¼ SW. ¼ sec. 3, T. 11 S., R. 98 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The rocks lie practically flat.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. Several measurements in the mine show coal from 3 feet 7 inches to 3 feet 10 inches, with no partings.

Sample 3541 was taken from room 1, west entry, where the coal is 3 feet 10 inches thick.

Sample 3539 was taken from room 1, south entry, where the bed is 3 feet 7 inches thick.

Sample 3549 was taken from room 5, west entry, where the bed is 3 feet 9 inches thick.

Note.—Output in 1910, 17,460 tons.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. NORWOOD PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3543 (p. 74).

Mine.—Norwood prospect; 1¾ miles northeast of Palisades in sec. 3, T. 11 S., R. 98 W.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. A sample of weathered coal was taken from this prospect on the Upper or Cameo bed.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in prospect, 1¾ miles northeast of Palisades.

Laboratory No	3543	
	Ft.	*in.*
Coal	2	4
Bony coal [a]	0	5½
Coal	1	10
Bone [a]	0	8
Coal	2	8
Thickness of bed	7	11½
Thickness of coal sampled	6	10

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 371. p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. RIVERSIDE MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3546 (p. 74).

Mine.—Riverside; 1½ miles northeast of Palisades in the NW. ¼ SE. ¼ sec. 3, T. 11 S., R. 98 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in Riverside mine, 1½ miles northeast of Palisades.

Laboratory No	3546	
	Ft.	*in.*
Coal	0	6
Shale [a]	0	3
Coal	2	6
Thickness of bed	3	3
Thickness of coal sampled	3	0

[a] Not included in sample.

The sample was taken from the working face of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 74; also U. S. Geol. Survey Bull. 371, p. 44; Bull. 316, p. 316.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. GARFIELD MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3545 (p. 75).

Mine.—Garfield; 2 miles northwest of Palisades in the SE. ¼ NE. ¼ sec. 6, T. 11 S., R. 98 W.

Coal bed.—Palisades. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown on the following page:

Section of coal bed in Garfield mine, 2 miles northwest of Palisades.

Laboratory No	3545	
	Ft.	*in.*
Coal	1	1
Bone [a]	0	2
Coal	1	9
Bone	0	¼
Coal	3	2
Bone [a]	0	9
Coal	1	0
Thickness of bed	7	11¼
Thickness of coal sampled	7	¼

[a] Not included in sample.

Note.—Output in 1910, 3,300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 316, p. 316; Bull. 371, p. 44.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. PROSPECT PIT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3540 (p. 75).

Location.—Prospect pit; 2 miles northeast of Palisades, in the NE. ¼ sec. 3, T. 11 S., R. 98 W.

Coal bed.—Cameo. Cretaceous age, Mesaverde formation. The rocks dip low, to the northeast.

The bed was measured and sampled by G. B. Richardson in the summer of 1906, as shown below:

Section of coal bed in prospect, 2 miles northeast of Palisades.

Laboratory No	3540	
	Ft.	*in.*
Coal	4	3
Bony coal [a]	0	5½
Coal	0	10
Thickness of bed	5	6½
Thickness of coal sample	5	1

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 371, p. 44; Bull. 316, p. 316.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 371, p. 11.

PALISADES. PATTERSON MINE.

Sample.—Semibituminous (?) coal; Grand Mesa field; analysis No. 5535 (p. 75).

Mine.—Patterson; an abandoned drift mine in the Palisades district, 9 miles southeast of Palisades in the SW. ¼ SE. ¼ sec. 17, T. 12 S., R. 97 W.

Coal bed.—Cameo. Cretaceous age, Paonia member of the Mesaverde formation. Thickness, uniform; dip, slightly toward the northeast. The coal is overlain with carbonaceous shale, and underlain with shale below which is massive sandstone.

The bed was measured and sampled by W. T. Lee on July 1, 1907, as described below.

Section of coal bed in Patterson mine, 9 miles southeast of Palisades.

Laboratory No	5535	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal, bony [a]	1	0
Coal	4	0
Floor, shale.		
Thickness of bed	5	0
Thickness of coal sampled	4	0

[a] Not included in sample.

Notes.—The coal was collected from a freshly cleared face, 125 feet from the mouth of the opening in the main entry of the abandoned mine. The coal from this mine, like that from other mines in this district, is rather soft and slacks on exposure to the weather. It is not considered a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 341, p. 333.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 319.

MOFFAT COUNTY.

Certain cities and towns now included in Moffat County are here listed under Routt County (see pp. 154–166).

MONTEZUMA COUNTY.

MANCOS. SPENCER MINE.

Sample.—Bituminous coal; Mesa Verde field; analyses Nos. 3992, 4225 (p. 75).

Mine.—Spencer; 2½ miles southeast of Mancos, Montezuma County. No railroad connection.

Coal bed.—Spencer. Cretaceous age, Mesaverde formation. Dip, 3½° S., 30° E. Roof, shale; floor, sandstone.

The bed was sampled and measured on October 18, 1906, by J. A. Taff. The sample (No. 3992) represented 3 feet 2 inches of coal.

The bed in this mine was also measured and sampled at a subsequent date in 1906 by James H. Gardner, the sample (No. 4225) including 3 feet of coal.

Notes.—This coal had been mined to supply local demand at the town of Mancos and surrounding country for over 18 years. The coal is bituminous and was especially sought for domestic fuel. Some coal had been shipped by the Rio Grande Railroad to the mining camps at Telluride.

For chemical analyses of this coal see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 336.

MANCOS. WOOD MINE.

Sample.—Bituminous coal; Mesa Verde field; analysis No. 3991 (p. 75).

Mine.—Wood; in sec. 36, T. 36 N., R. 13 W., 3 miles southwest of Mancos. No railroad connection.

Coal bed.—Spencer. Cretaceous age, Mesaverde formation. Dip, 3½° S., 30° E.

The bed was measured and sampled on October 15, 1906, by C. D. Smith, as shown below.

Section of coal bed in Wood mine, 3 miles southwest of Mancas.

Laboratory No.	3991
	Ft. in.
Coal	1 4
Shale [a]	0 5
Coal	2 7
Thickness of bed	4 4
Thickness of coal sampled	3 11

[a] Excluded from sample.

The sample was taken 100 feet in.

Note.—This coal makes good domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 316, p. 423.

Mancos. Haller Prospect.

Sample.—Bituminous coal; Durango field; analysis No. 4330 (p. 75).

Mine.—Haller prospect; in sec. 30, T. 37 N., R. 13 W., 7 miles north of Mancos.

Coal bed.—The coal is of Cretaceous age, Dakota formation.

The bed was measured and sampled by M. K. Shaler, in 1906. No record of the section was preserved.

For chemical analyses of this coal, see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 471.

Mancos. Haller Mine.

Sample.—Bituminous coal; Durango field; analysis No. 3993 (p. 75).

Mine.—Haller; in the NE. ¼ SE. ¼ sec. 29, T. 37 N., R. 13 W., 8 miles north of Mancos.

Coal bed.—In the Dakota sandstone. The coal is of Cretaceous age.

The bed was measured and sampled by C. D. Smith on October 16, 1906. The sample was taken from a point 55 feet from mouth of mine, the cut measuring 2 feet 9 inches. It probably did not represent entire thickness of the bed.

For chemical analyses of this coal, see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 316, p. 423.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 316, p. 387.

Mancos. Todd Mine.

Sample.—Bituminous coal; Durango field; analysis No. 4226 (p. 75).

Mine.—Todd; 10 miles southwest of Mancos and about 6 miles southeast of Cortez; in sec. 28, T. 35 N., R. 14 W.

Coal bed.—This coal is of the Cretaceous age and is in the Mesaverde formation approximately at the horizon of the Spencer bed (see description of analysis No. 4225). Dip, 7° S. Thickness, 28 to 30 inches; roof and floor, shale.

The bed was measured and sampled by J. H. Gardner in 1906, the sample representing 2 feet 4 inches of clear coal.

Notes.—This coal was mined for local demand at Cortez and surrounding country. The coal is considered good domestic fuel and leaves white incoherent ash.

For chemical analyses of this coal, see part I of this bulletin, p. 75; also U. S. Geol. Survey Bull. 316, p. 423.

PITKIN COUNTY.

Coal Basin. Coal Basin Mine.

Sample.—Semibituminous coal; Coal Basin field; analyses Nos. 5255 and 5346 (Denver No. 29), and analyses Nos. 4041, 4043, 4047, 4049, 5249, 5262 (pp. 75, 76).

Mine.—Coal Basin; a slope mine in sec. 5, T. 10 S., R. 89 W., at Coal Basin, about 30 miles south of Glenwood Springs, on the Crystal River Railroad.

Coal bed.—"Sunshine" and Coal Basin. The coal is of Cretaceous age, Mesaverde formation. Thickness, fairly uniform.

The "Sunshine" bed was measured and sampled at two points in 1908 by K. M. Way, and at six points on October 23, 1906 by A. K. Adams, as described below:

Section of coal bed in Coal Basin mine at Coal Basin.

Section	A		B	
Laboratory No	5255		5346	
	Ft.	in.	Ft.	in.
Coal (soft)	3	3	..	..
Coal	2	4	6	6
Bony coal[a]	1	4	..	..
Thickness of bed	6	11	6	6
Thickness of coal sampled	5	7	6	6

[a] Not included in sample.

Section A (sample 5255) was taken on the second level, 1,100 feet southwest of opening, on a new slope, and was a waste sample.

Section B (sample 5346) was taken 1,100 feet west of opening on new slope and was a waste sample.

Sample 4041 represented 6¼ feet of coal, which was underlain with 1¾ feet of coal not included in the sample. The sample was taken from the upper bench on level 3, 600 feet from the mouth of the mine.

Sample 4043 represented 9 feet of coal taken from the upper bench, 1,600 feet from the mouth of the mine.

Sample 4047 also represented 9 feet of coal taken from the upper bench, but was taken 2,200 feet from the mouth of the mine.

Sample 4049 represented a 9-foot cut taken 2,500 feet from the entrance of the mine in room 50.

Sample 5249 (called bone coal) represented 5 feet of bony coal, above which is 6½ feet of bone coal. It was taken in the second level on the right of the slope (Coal Basin bed).

Sample 5262 included 3 feet 10 inches of bony coal from the Coal Basin bed: It was taken in an air course off the main slope.

For results of tests of this coal, see mention of specific tests as follows: Washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 54.

For chemical analyses see part I of this bulletin, p. 75; also Bureau of Mines Bull. 5, p. 23.

For geologic relations, see U. S. Geol. Survey Bull. 316, p. 993.

GULCH. (SPRING GULCH STATION). SPRING GULCH MINE.

Sample.—Bituminous coal; Glenwood Springs field; analyses Nos. 4009, 4010, 9198, 9199 (p. 76).

Mine.—Spring Gulch; in sec. 22, T. 8 S., R. 89 W., at Spring Gulch on the Jerome Park Branch of the Colorado Midland Railroad.

Coal bed.—Anderson, and Allen or Sunshine. The coal is of Cretaceous age, Mesaverde formation. The Anderson bed is from 4½ to 6 feet thick; dips 20° to 30°, S. 85° W.; roof, shale lenses overlaid with sandstone; floor, thin shale underlain with sandstone. The Allen or Sunshine bed is from 8 to 11 feet 6 inches thick. Dip, 20°, S. 85° W.; roof, lenses of shale overlain with sandstone; floor, thin shale bed underlain with sandstone.

The Anderson bed was measured and sampled by A. L. Beekly in October, 1909, as described below:

Sample 9199 was taken in north Anderson entry on Anderson bed, about 5,200 feet north of opening, and represented a cut of 4 feet 6 inches of coal.

The beds in this mine were also measured and sampled on October 16, 1906, by A. K. Adams, as described below:

Sample 9198, from Sunshine bed, was taken near face of first entry south, about 5,200 feet south of the main slope haulage way and represented 8 feet 4 inches of coal.

Sample 4009 was taken from Anderson bed, 2,070 feet from entrance of mine, and represented 4 feet 10 inches of coal.

Sample 4010, from Sunshine bed, represented 11½ feet of coal, above which was 2 feet 6 inches of coal not included in the sample. The sample was taken 5,300 feet from opening.

Notes.—This coal is a high-grade bituminous coking coal, hard and clean. In 1909 about two-fifths of the output (700 tons per day) of the mine was taken from the Anderson bed; about three-fourths of the output was made into coke at Cardiff, Colo.; the remainder was used for engine coal by the Colorado Midland Railroad.

For chemical analyses of this coal see part I of this bulletin, p. 76; also U. S. Geol. Survey Bull. 316, p. 300; Bull. 415, p. 250.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 292; Bull. 415, p. 134.

RIO BLANCO COUNTY.

ANGORA. LOCAL MINE.

Sample.—Bituminous coal; Lower White River field; analysis No. 5516 (p. 77).

Mine.—Local; on north bank of White River between Scullion Gulch and Redwash, southwest of Angora, in the SW. ¼ NE. ¼ sec. 11, T. 2 N., R. 101 W. No railroad connection.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. Coal bed dips 9° S. The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in local mine southwest of Angora.

Laboratory No	5516	
Roof, sandstone.	*Ft.*	*in.*
Coal [a]	0	6
Coal	3	8
Thickness of bed	4	2
Thickness of coal sampled	3	8

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 415, p. 250.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 314; Bull. 415, p. 192.

COAL CREEK. WESSON MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3791 (p. 77).

Mine.—Wesson, on west side of Coal Creek west of the "Transfer" in sec. 30, T. 2 N., R. 92 W., 12 miles northeast of Meeker. No railroad connection.

Coal bed.—Wesson. Cretaceous age, Mesaverde formation. Dip, 22°, N. 70° W. Thickness about 25 feet, middle part of which only is mined.

The bed was measured and sampled on September 11, 1906, by H. S. Gale, as shown below:

Section of part of coal bed in Wesson mine on west side of Coal Creek.

Laboratory No	3791	
	Ft.	*in.*
Coal	3	0
Coal, dirty [a]	0	2
Coal	1	6
Coal, dirty [a]	0	2
Coal	4	3
Thickness of bed mined	9	1
Thickness of coal sampled	8	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 163; Bull. 316, p. 285.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 415, p. 163.

CURTIS CREEK. PROSPECT.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3851 (p. 77).

Mine.—Prospect drift on land of W. H. Miller in Curtis Creek Canyon, 6½ miles north of Meeker, near line between secs. 29 and 32, T. 2 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 17° N.

The bed was measured and sampled on September 20, 1906, by H. S. Gale, as shown below.

Section of coal bed in prospect drift on Curtis Creek.

Laboratory No.	3851	
	Ft.	*in.*
Roof, shale.		
Coal	2	3
Coal, dirty [a]	0	3
Coal	1	4
Bone [a]	0	1
Coal	1	4
Floor, shale.		
Thickness of bed	5	3
Thickness of coal sampled	4	11

[a] Excluded from sample.

The sample was taken in main entry, 70 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey; Bull. 316, p. 299; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 289; Bull. 415, p. 161.

MEEKER. FAIRFIELD MINE.

Sample.—Bituminous coal; Danforth Hills field; analyses Nos. 3482, 3498 (p. 77).

Mine.—Fairfield; 2½ miles west of Meeker, in the NW. ¼ SW. ¼ sec. 28, T. 1 N., R. 94 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 30° N.

The bed was measured and sampled at two points on July 28, 1906, by H. S. Gale, as shown below.

Section of coal bed in Fairfield mine, 2½ miles west of Meeker.

Laboratory No.	3482		3498	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	11	6	3
Clay	[a]0	1¼	..	..
Coal	7	7¾	[a]1	1½
Thickness of bed	9	8	7	4½
Thickness of coal sampled	9	6¾	6	3

[a] Excluded from sample.

Sample 3482 was obtained from the main entry, 650 feet from the mouth of the mine

Sample 3498 was taken 525 feet from the mouth of the mine, on a bed about 70 feet above the bed from which sample 3482 was taken.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 297; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 277; Bull. 415, p. 143.

MEEKER. ADAMS MINE.

Sample.—Bituminous coal; Danforth Hills field; analyses Nos. 3483, 3504 (p. 77).

Mine.—Adams (local); Meeker district, in the SE. ¼ SE. ¼ sec. 29, T. 1 N., R. 94 W., on stage road 2 miles west of Meeker. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 42° N., 82° W.

The bed was sampled and measured in 1906 by H. S. Gale, as shown below:

Sections of coal bed in Adams mine, 2 miles west of Meeker.

Laboratory No.	3483		3504	
	Ft.	*in.*	*Ft.*	*in.*
Coal	[a]1	½	5	1½
Coal	4	1	0	1
Clay	[a]0	1	[a]1	11
Coal	[a]1	4	[a]0	5
Bone	[a]0	5	[a]1	0
Coal	[a]1	0	[a]1	0
Bone	[a]1	0	..	..
Thickness of bed	8	11½	9	6½
Thickness of coal sampled	4	1	7	½

[a] Not included in sample.

The samples were taken about 100 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 297; Bull. 415, pp. 248, 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 279; Bull. 415, p. 146.

MEEKER. POLLARD MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3849 (p. 77).

Mine.—Pollard; in sec. 22, T. 1 N., R. 94 W., about 3 miles northwest of Meeker. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. The bed dips 28° NW.

The bed was sampled and measured on September 18, 1906, by H. S. Gale, as shown below:

Section of middle part of coal bed in Pollard mine, 3 miles northwest of Meeker.

Laboratory No.	3849	
	Ft.	*in.*
Coal	2	9
Coal, pyritiferous [a]	0	½
Coal	3	4
Thickness of bed	6	1½
Thickness of coal sampled	6	1

[a] Excluded from sample.

The sample was taken in the mine about 510 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geological relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 288; Bull. 415, p. 153.

MEEKER. BLACK DIAMOND MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3847 (p. 77).

Mine.—Black Diamond; in sec. 15, T. 1 N., R. 94 W., 3½ miles northwest of Meeker. No railroad connection.

Coal bed.—Lord. Cretaceous age, Mesaverde formation. Thickness, about 20 feet; dip, 19° N., 80° W.

The bed was measured and sampled on September 18, 1906, by H. S. Gale, as shown below:

Section of coal bed in Black Diamond mine, 3½ miles northwest of Meeker.

Laboratory No.	3847	
	Ft.	*in.*
Coal	3	11
Mother coal	0	½
Coal	3	10
Thickness of bed	7	9½
Thickness of coal sampled	7	3

There was coal both above and below this section. The sample was taken in the mine about 200 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 287; Bull. 415, p. 153.

MEEKER. LION CANYON MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3502 (p. 77).

Mine.—Lion Canyon; Meeker district; in the SE. ¼ NW. ¼ sec. 29, T. 1 N., R. 94 W., 3½ miles west of Meeker, on the main stage road. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 60° NW.

The bed was sampled and measured in 1906 by H. S. Gale; the sample represented 8 feet 5 inches of coal.

The sample was taken in the mine, 1,140 feet from entrance.

Note.—The coal was reported to be excellent domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 297; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 280; Bull. 415, p. 148.

RANGELY. RECTOR MINE.

Sample.—Bituminous coal; Lower White River field; analyses Nos. 5519, 5520 (p. 77).

Mine.—Rector; 3 miles south of Rangely, on the south side of Raven Park, on Dragon Road, in sec. 14, T. 1 N., R. 102 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 9° SW.

The bed was sampled and measured in two sections in 1907 by H. S. Gale, as shown below:

Sections of coal bed in Rector's mine, 3 miles south of Rangely.

Laboratory No.	5519		5520	
	Ft.	*in.*	*Ft.*	*in.*
Coal	4	3	[a]4	3
Bone	[a]0	2	[a]0	2
Coal	7	6	7	6
Thickness of bed	11	11	11	11
Thickness of coal sampled	11	9	7	6

[a] Not included in sample.

Both samples were taken from the same place, about 90 feet from the entrance.

Sample 5519 was somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 341, p. 314; Bull. 415, p. 250.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 415, p. 195.

SPRING CREEK. PROSPECT.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3846 (p. 77).

Location.—Prospect; on Spring Creek, at Ninemile Hill, and 14 miles north of Meeker, in T. 2 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Thickness, 4 feet 6 inches of clean coal.

The bed was measured and sampled on September 20, 1906, by H. S. Gale. The sample represented the whole of the 4½-foot bed. The coal was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 77; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 289; Bull. 415, p. 162.

SULPHUR CREEK. SULPHUR CREEK MINE.

Sample.—Bituminous coal; Danforth Hills field; analyses Nos. 3845, 3848, 3850 (p. 77).

Mine.—Sulphur Creek; a working mine and several prospect entries at Sulphur Creek, 4 miles north of Meeker, in the NE. ¼ NE. ¼ sec. 10, and in the SE. ¼ sec. 3, T. 1 N., R. 94 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 16° to 20° NW.

The bed was measured and sampled at three places on September 18, 1906, by H. S. Gale, as shown below.

Sections of coal bed in Sulphur Creek mine at Sulphur Creek.

Laboratory No.	3845		3848		3850	
Roof: Lab. No. 3845, massive sandstone; Lab. No. 3848, coal; Lab. No. 3850, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone	[a]1	0	..	..	..	..
Coal	1	3	1	2	[a]1	4
Sandstone	..	..	..	..	0	½
Bone, sandy	[a]0	1	[a]0	½	..	..
Coal	0	8	0	11	..	..
Bone, sandy	[a]0	1	[a]0	½	..	..
Coal	4	0	3	1	3	9
Floor: Lab. Nos. 3845 and 3848, bone; Lab. No. 3850, bone coal.						
Thickness of bed	7	1	5	3	5	1½
Thickness of coal sampled	5	11	5	2	3	9½

[a] Not included in the sample.

Sample 3845 was obtained in the main entry, 470 feet from the entrance.

Sample 3848 was obtained from the face of side entry, 280 feet from entrance.

Sample 3850 was probably weathered. It was taken in the mine, 180 feet from the entrance of the mine.

For chemical analyses of this coal see part I of this bulletin, pp. 77, 78; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 286; Bull. 415, p. 154.

THORNBURG. WILSON MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3792 (p. 78).

Mine.—Wilson; in Milk Creek Canyon below Thornburg, in the NW. ¼ SE. ¼ sec. 29, T. 3 N., R. 92 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 15° N., 80° W.

The bed was measured and sampled on September 12, 1906, by H. S. Gale, as shown below:

Section of coal bed in Wilson mine, below Thornbury.

Laboratory No.	3792	
Roof, shale.	*Ft.*	*in.*
Coal [a]	2	0+
Shale, carbonaceous [a]	1	0
Coal [a]	4	1
Coal	7	0
Shale, carbonaceous [a]	2	0
Coal [a]	2	0+
Thickness of bed	18	1+
Thickness of coal sampled	7	0

[a] Not included in sample.

The sample was taken in the mine, 37 feet from the entrance. The coal appeared fresh, but may have been weathered.

For chemical analyses of this coal see part I of this bulletin, p. 78; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 284; Bull. 415, p. 169.

ROUTT COUNTY.[a]

Anthracite. Keitel Mine.

Sample.—Bituminous coal; Yampa field; analysis No. 1946 (p. 78).

Mine.—Keitel; at Anthracite, 18 miles northeast of Hayden at the head of Miller Gulch, in sec. 24, T. 8 N., R. 87 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 4° W.

The bed was sampled and measured in 1905, by N. M. Fenneman.

The coal bed is 4 feet 1 inch thick. The thickness of the coal sampled was also 49 inches.

The sample was taken in the main entry, 50 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 78; also U. S. Geol. Survey Bull. 285, p. 238; Bull. 297, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 71.

Anthracite. Crawford Mine.

Sample.—Bituminous and anthracite coal; Yampa field; analyses Nos. 1902, 1936, 1937 (p. 78).

Mine.—Crawford; west of Anthracite, and 14 miles northeast of Hayden, in sec. 27, T. 8 N., R. 87 W. No railroad connection.

Coal bed.—Crawford 11-foot and Crawford 6-foot. Cretaceous age, Mesaverde formation. Dip, 20° W.

The beds were measured and sampled in 1905 by H. S. Gale and N. M. Fenneman. The upper bed measured 6 feet 2 inches. Sample 1936 was obtained in the main entry, 140 feet from the entrance. It was taken 150 feet above the coal represented by analyses Nos. 1902 and 1937, and represented 6 feet 2 inches of coal. Samples 1902 and 1937, taken from bottom bed, represented a bench 6 or 7 feet thick, with 6 or 8 inch parting near the middle of the bed.

Note.—The coal in sample 1902 is locally converted to anthracite by a sheet of basalt underlying the bed at about 40 feet.

For chemical analyses of this coal see part I of this bulletin, p. 78; also U. S. Geol. Survey Bull. 297, p. 84.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 69.

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[a] Certain towns and mines now included in Moffat County are here listed under Routt County.

AXIAL. SHAFER MINE.

Sample.—Bituminous (?) coal; Danforth Hills field; analyses No. 3707 (p. 78).

Mine.—Shafer; on Milk Creek, east of Axial, in sec. 31, T. 4 N., R. 92 W., Routt County. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 1, 1906, by H. S. Gale, as shown below:

Section of coal bed in Shafer mine, east of Axial.

Laboratory No	3707	
Roof, shale.	*Ft.*	*in.*
Coal	12	0
Bone[a]	0	2+
Coal	2	0
Thickness of bed of coal sampled	14	2+
Thickness of coal sampled	7	6

[a] Excluded from sample.

The sample was taken in the main entry, 119 feet from the entrance. The coal is hard and was used for ranch purposes.

For chemical analyses of this coal see part I of this bulletin, p. 78; also U. S. Geol. Survey Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 283; Bull. 415, p. 171.

AXIAL. KEYSTONE PROSPECT NEAR RESERVOIR.

Sample.—Bituminous coal; Danforth Hills field; analyses Nos. 3569, 3571 (p. 78).

Mine.—Near Keystone reservoir, in E. ½ sec. 30, T. 4 N., R. 95 W., on Deep Channel Creek, near Axial.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. The bed is 7 feet thick with a sandstone roof.

The bed was measured and sampled at two points in the mine on August 11, 1906, by H. S. Gale.

Sample 3569 represented a 7-foot cut of weathered coal. It was taken 30 feet in mine.

Sample 3571 also represented a 7-foot cut of weathered coal. It was taken 90 feet in mine.

Notes.—At the time of sampling a drift had been driven 90 feet. The bed was mined solely for use at the ranch.

For chemical analyses of this coal see part I of this bulletin, p. 78; also U. S. Geol. Survey Bull. 415, p. 249; Bull. 316, p. 298.

For geologic relations see U. S. Geol. Survey Bull. 415, p. 177.

AXIAL. SMITH MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3703 (p. 79).

Mine.—Smith; 1 mile south of Axial on Spring Creek, in sec. 35, T. 4 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 10° SW.

The bed was measured and sampled on October 1, 1906, by H. S. Gale.

This bed is reported to be 28¾ feet thick.

The sample was taken from lower part of upper bench, 115 feet from the mouth of the mine, where the following section was measured:

Section of part of coal bed in Smith mine, 1 mile south of Axial.

Laboratory No	3703	
	Ft.	*in.*
Roof, clay.		
Coal [a]	3	0
Coal, dirty [a]	0	4
Coal	5	0
Bone [a]	0	1
Coal (base not reached) [a]	..	..
Thickness of bed	8	5
Thickness of coal sampled	5	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 316, p. 298; Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 283; Bull. 415, p. 172.

AXIAL. COLLOM MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3466 (p. 79).

Mine.—Collom; 1½ miles south of Axial, on the Meeker stage road on Spring Creek, in sec. 2, T. 3 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dips slightly to the east or southeast.

The bed was measured and sampled in 1906 by H. S. Gale, as shown below:

Section of coal bed in Collom mine, 1½ miles south of Axial.

Laboratory No	3466	
	Ft.	*in.*
Roof, shale.		
Coal [a]	8	6
Shale or bone [a]	0	½
Coal	16	3
Floor, shale.		
Thickness of bed	24	9½
Thickness of coal sampled	16	3

[a] Not included in sample.

This coal has been mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 276; Bull. 415, p. 167.

AXIAL. JAMES MINE.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3704 (p. 79).

Mine.—James; 4 miles south of Axial, on the Meeker stage road on Spring Creek, in sec. 14, T. 3 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 8° S., 20° E.; roof, shale; floor, bone coal.

The bed was measured and sampled on September 1, 1906, by H. S. Gale. The sample represented 8 feet of coal. It was obtained in the main entry, 100 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 283; Bull. 415, p. 168.

Axial. Morgan Mine.

Sample.—Bituminous coal; Danforth Hills field; analyses Nos. 3688, 3690 (p. 79).

Mine.—Morgan; 7 miles west of Axial, on Morgan Gulch, in sec. 14, T. 4 N., R. 94 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 6° S.

The bed was measured and sampled in two places on August 27, 1906, by H. S. Gale.

Sections of coal bed in Morgan mine, 7 miles west of Axial.

Laboratory Nos	3688		3690	
	Ft.	*in.*	*Ft.*	*in.*
Sandstone [a]	7	0	7	0
Shale [a]	3	0	3	0
Coal [a]	4	0	4	10
Coal	6	0	5	2
Thickness of bed	20	0	20	0
Thickness of coal sampled	6	0	5	2

[a] Not included in sample.

Sample 3688 was obtained in the main entry, 110 feet from the entrance.

Sample 3690 was obtained in the main entry, 60 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 281; Bull. 415, p. 174.

Axial. Prospect.

Sample.—Bituminous coal; Danforth Hills field; analysis No. 3689 (p. 79).

Location.—Prospect; in Boxelder Gulch, 10 miles west of Axial, in sec. 16, T. 4 N., R. 94 W. No railroad connection.

Coal bed.—Upper. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on August 27, 1906, by H. S. Gale, as shown below:

Section of coal bed in prospect, 10 miles west of Axial.

Laboratory No	3689	
	Ft.	*in.*
Roof, shale.		
Coal	5	0
Coal, clayey [a]	1	0
Coal	4	0
Thickness of bed	10	0
Thickness of coal sampled	9	0

[a] Not included in sample.

The coal was weathered and wet.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 415, p. 249.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 282; Bull. 415, p. 175.

CRAIG. MOORE MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 9134 (p. 79).

Mine.—Moore; in sec. 16, T. 5 N., R. 90 W., about 10 miles southeast of Craig. It has no railroad and would not be easily accessible to the proposed Denver, Northwestern & Pacific because of the high divide between.

Coal Bed.—Moore. Cretaceous age, Mesaverde formation; about 1,000 feet stratigraphically above the base and about 450 feet below the top of the Trout Creek sandstone mentioned in United States Geological Survey Bulletin 297, page 26. It is extremely variable in thickness and character; it dips northerly about 8 to 10°.

The Moore mine is the only mine on the bed; it was sampled and measured on August 21, 1909, by Frank R. Clark, as described below:

Section of coal bed in Moore mine, 10 miles southeast of Craig.

Laboratory No	9134
Roof, bone.	*Ft. in.*
Coal	2 6
Shale, bony [a]	0 6
Coal	2 2
Floor, bone.	
Thickness of bed	5 2
Tickness of coal sampled	4 8

[a] Not included in sample.

The sample was taken about 140 feet northwest of the opening.

Note.—This coal was mined intermittently for domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 79.

CRAIG. HAUBRICH MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 9137 (p. 79).

Mine.—Haubrich; in the NW. ¼ SW. ¼ sec. 29, T. 6 N., R. 91 W., 10 miles southwest of Craig. It had no railroad connection when sampled, but is approximately 5 miles south of the nearest point on the route of the Denver, Northwestern & Pacific Railway, which in 1909 was completed as far as Steamboat Springs.

Coal bed.—This bed occurs in the Mesaverde formation, Cretaceous age. It is about 3,350 feet stratigraphically above the base and is about 800 feet above the Twenty-mile sandstone mentioned in United States Geological Survey Bulletin 297, page 27. Thickness, 3 to 6 feet, often containing partings of shale; dip, northerly about 10°.

The bed was sampled by Frank R. Clark on July 19, 1909, as described below:

Section of coal bed in Haubrich mine, 10 miles southwest of Craig.

Laboratory No	9137
Roof, gray shale.	*Ft. in.*
Coal, poor [a]	2 3
Coal, good, no partings	4 7
Floor, sandstone, massive, white.	
Thickness of bed	6 10
Thickness of coal sampled	4 7

[a] Not included in sample.

The sample was taken at the end of an entry about 70 feet long.

Notes.—This coal was used for domestic use and was mined only as occasion demanded.

For chemical analyses of this coal see part I of this bulletin, p. 79.

CRAIG. RATCLIFF MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 9138 (p. 79).

Mine.—Ratcliff; in the SW. ¼ SE. ¼ sec. 31, T. 6 N., R. 91 W., about 11 miles southwest of Craig. Approximately 6 miles south of the nearest point of the proposed (1909) route of the Denver, Northwestern & Pacific Railroad.

Coal bed.—This bed is part of the Mesaverde formation, of Cretaceous age. It is approximately 2,250 feet stratigraphically above the base and about 650 feet above the top of the Trout Creek sandstone. Thickness, 9 to 12 feet; dip, about 10° to 12° N. The bed is mined at only one place, which was sampled on July 19, 1909, by Frank R. Clark, as described below:

Section of coal bed in Ratcliff mine, 11 miles southwest of Craig.

Laboratory No	9138	
Main roof, shale.	*Ft.*	*in.*
Coal[a]	2	0
Shale, brown [a]	1	0
Coal, no partings	10	0
Thickness of bed	13	0
Thickness of coal sampled	10	0

[a] Not included in sample.

This sample was taken at the end of a tunnel, 60 feet in the mine.

Note.—The coal from this mine was used rather extensively in Craig for domestic purposes and the mine was operated almost continuously, though with a small tonnage.

For chemical analyses of this coal see part I of this bulletin, p. 79.

CRAIG. WISE MINE.

Sample.—Subbituminous coal; Yampa field; anaylsis No. 9135 (p. 79).

Mine.—Wise; in the NW. ¼ sec. 6, T. 5 N., R. 91 W., about 12 miles southwest of Craig, and approximately 6 miles south of the nearest point of the proposed route of the Denver, Northwestern & Pacific Railroad.

Coal bed.—Huntington Beach. Cretaceous age, Mesaverde formation. It is approximately 2,000 feet stratigraphically above the base and about 400 feet above the top of the Trout Creek sandstone. The bed varies in this township from 100 inches to 120 inches in thickness and contains a parting of brown shale which has a maximum observed thickness of 24 inches. It dips north at about 10° to 12°.

The bed has been mined at only one place, which was sampled on July 19, 1909, by Frank R. Clark, as described below:

Section of coal bed in Wise mine, 12 miles southwest of Craig.

Laboratory No	9135	
Main roof, brown shale.	*Ft.*	*in.*
Coal	8	6
Coal, poor [a]	0	6
Thickness of bed	9	0
Thickness of coal sampled	8	6

[a] Not included in sample.

This sample was taken at the end of an entry 250 to 275 feet long.

Notes.—The coal from this mine was used exclusively for domestic purposes and the mine was operated according to the demand.

For chemical analyses of this coal see part I of this bulletin, p. 79.

EDDY. HUTCHINSON MINE.

Sample.—Bituminous coal; Yampa field; analysis No. 1832 (p. 79).

Mine.—Hutchinson, in sec. 12, T. 5 N., R. 86 W., on Middle Creek, west of Eddy. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1905 by M. R. Campbell, as shown below:

Section of coal bed in Hutchinson mine, west of Eddy.

Laboratory No.	1832	
	Ft.	*in.*
Coal [a]	4	6
Coal	5	0
Thickness of bed	9	6
Thickness of coal sampled	5	0

[a] Not included in sample.

The coal was mined for local ranch use.

The sample, obtained about 10 feet from the surface, may have been somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 285, p. 230; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 50.

EDDY. PROSPECT.

Sample.—Bituminous coal; Yampa field; analysis No. 1831 (p. 79).

Location.—Prospect; on Trout Creek, 7 miles southwest of Eddy, in sec. 14, T. 4 N., R. 86 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in July, 1905, by Fenneman and Gale, as shown below:

Section of coal bed in prospect. 7 miles southwest of Eddy.

Laboratory No.	1831	
	Ft.	*in.*
Coal	3	9
Bone [a]	0	3
Coal	0	5
Bone [a]	0	3
Coal	1	0+
Thickness of bed	5	8+
Thickness of coal sampled	5	2

[a] Excluded from sample.

The sample was taken in drift, 40 feet from entrance. The coal was somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 285, p. 230; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 45.

HAMILTON. HAMILTON MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 9136.

Mine.—Hamilton, in sec. 24, T. 5 N., R. 91 W., 3 miles southeast of Hamilton, about 10 miles south of Craig. No railroad connection.

Coal bed.—This bed is in the Mesaverde formation (Cretaceous age), about 325 feet stratigraphically above the base, being the lowest coal noted in this formation in T. 5 N., R. 91 W., and T. 5 N., R. 90 W.

The bed was sampled and measured by F. R. Clark on August 21, 1909, at the only place where it is mined. The section was as follows:

Section of coal bed at Hamilton mine, at Hamilton.

Laboratory No.	9136	
	Ft.	*in.*
Main roof, shale, brown.		
Coal, no partings	2	8
Coal, apparently better and harder	3	0
Floor, shale, brown.		
Thickness of bed	5	8
Thickness of coal sampled	5	8

The section was measured at the end of an entry 150 feet long.

Notes.—The coal was mined intermittently for domestic use. The bed is variable in thickness and probably lenticular, as at no other place measured did it have this thickness.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 471.

HAYDEN. BARNES MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 2033 (p. 79).

Mine.—Barnes, on Sage Creek in sec. 36, T. 6 N., R. 88 W., about 6 miles south of Hayden. No railroad connections.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 28° NE.

The bed was measured and sampled by H. S. Gale in 1905, as shown below:

Section of coal bed in Barnes mine, 6 miles south of Hayden.

Laboratory No.	2033	
	Ft.	*in.*
Coal	5	7
Bone [a]	0	3
Coal	1	0
Thickness of bed	6	10
Thickness of coal sampled	6	7

[a] Excluded from sample.

The sample was obtained in the main entry, 300 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 79; also U. S. Geol. Survey Bull. 285, p. 232; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 55.

HAYDEN. LOCAL MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 2032 (p. 80).

Mine.—No name; on Sage Creek, 6 miles south of Hayden, in sec. 2, T. 5 N., R. 88 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 28° NE. The bed lies 75 feet above that described under analysis No. 2033.

The bed was measured and sampled by H. S. Gale in 1905. It showed 11 feet 5 inches of clean coal.

The sample represented the entire bed and was taken in the main entry, 40 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 233; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 55.

HAYDEN. DRY CREEK MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 2082 (p. 80).

Mine.—Dry Creek; 7 miles south of Hayden, in the NE. ¼ sec. 4, T. 5 N., R. 88 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 15° NW.

The bed was measured and sampled in 1905 by H. S. Gale, as shown below:

Section of coal bed in Dry Creek mine, 7 miles north of Hayden.

Laboratory No	2082	
	Ft.	*in.*
Coal [a]	3	0
Parting [a]	0	1
Coal	7	10
Thickness of bed	10	11
Thickness of coal sampled	7	10

[a] Not included in sample.

Note.—The coal is of good quality and has been hauled to Hayden for domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 233; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 56.

HAYDEN. WADGE MINE.

Sample.—Subbituminous (?) coal; Yampa field; analyses Nos. 2030, 2034 (p. 80).

Mine.—Wadge; on Yampa River, 8 miles east of Hayden, in sec. 15, T. 6 N., R. 87 W. No railroad connection.

Coal bed.—Wadge. Cretaceous age, Mesaverde formation. Thickness 8 feet 3 inches of clean coal.

The bed was measured and sampled in 1905 by H. S. Gale.

Sample No. 2030 was taken in old drift 250 feet from the entrance.

Sample No. 2034 was taken in new drift.

Both samples represented the full thickness of the coal bed.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 236; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 65.

HAYDEN. GREEN MINE.

Sample.—Subbituminous coal; Yampa field; analyses Nos. 9693, 2210 (p. 80).

Mine.—Green; 12 miles southwest of Hayden, on Hayden Gulch, in sec. 12, T. 4 N., R. 89 W. No railroad connection.

Coal bed.—Green. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1905 by H. S. Gale. The sample (2210) represented a 10-foot cut of coal, over which was 2 feet of sandstone.

The bed was also sampled and measured by Thomas Hamilton in 1909, as shown below:

Section of coal bed at Green mine, 12 miles southwest of Hayden.

Laboratory No	9693	
	Ft.	*in.*
Roof, sandstone.		
Coal	5	0
Bone [a]	0	11
Coal	2	0
Floor, shale, brown.		
Thickness of bed	7	11
Thickness of coal sampled	7	0

[a] Not included in sample.

The sample was taken at the end of an entry 180 feet long.

Notes.—This coal was used for domestic use and was mined spasmodically as occasion demanded.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 234; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 58.

HAYDEN. GARTMAN MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 2031 (p. 80).

Mine.—Gartman; 14 miles east of Hayden, on Butcherknife Creek, in sec. 1, T. 6 N., R. 87 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 15° SW.

The bed was measured and sampled in 1905 by H. S. Gale, as shown below.

Section of coal bed in Gartman mine, 14 miles east of Hayden.

Laboratory No.	2031	
	Ft.	*in*
Shale [a]	3	0
Coal	5	6
Bone [a]	0	4
Coal [a]	0	6
Shale [a]	2	0
Coal [a]	2	6
Thickness of bed	13	10
Thickness of coal sampled	5	6

[a] Not included in sample.

The sample was taken in the main entry, 30 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 236; Bull. 297, p. 85; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 66.

LAY. PROSPECT.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 3461 (p. 80).

Mine.—Prospect; south of Lay, in sec. 31, T. 7 N., R. 93 W. No railroad connection.

Coal bed.—Peacock. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1906 by H. S. Gale, as shown below:

Section of coal bed in prospect south of Lay.

Laboratory No.	3461	
	Ft.	*in.*
Roof, coal [a]	1	6
Coal	5	2
Bone [a]	0	4
Coal	2	0
Thickness of bed	9	0
Thickness of coal sampled	7	2

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 285, p. 235; Bull. 415, p. 248; Bull. 341, p. 314.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 63; Bull. 415, p. 227.

LAY. SWEENEY PROSPECT.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 3462 (p. 80).

Location.—Sweeney prospect; south of Lay, in sec. 31, T. 7 N., R. 93 W. No railroad connection.

Coal bed.—Sweeney. Cretaceous age, Mesaverde formation.

The bed was measured and sampled by H. S. Gale in 1906, as shown below:

Section of coal bed in Sweeney prospect, south of Lay.

Laboratory No.	3462	
	Ft.	*in.*
Coal [a]	3	10
Bone [a]	1	0
Coal	4	0
Bone [a]	1	7
Coal [a]	4	0
Thickness of bed	14	5
Thickness of coal sampled	4	0

[a] Not included in sample.

This sample was taken on a bed 100 feet below the one represented by laboratory No. 3461.

LAY. WISCONSIN MINE.

Sample.—Subbituminous (?) coal; Yampa field; analysis No. 3463 (p. 80).

Mine.—Wisconsin; south of Lay, in sec. 31, T. 7 N., R. 93 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1906 by H. S. Gale, as shown below:

Section of coal bed in Wisconsin mine, south of Lay.

Laboratory No.	3463	
	Ft.	*in.*
Coal [a]	9	9
Shale [a]	1	3
Coal [a]	4	11
Coal	5	7
Thickness of bed	21	6
Thickness of coal sampled	5	7

[a] Not included in sample.

The sample was taken on a bed 100 feet above the one represented by laboratory No. 3461.

For chemical analyses of this coal see part I of this bulletin, p. 80; also U. S. Geol. Survey Bull. 341, p. 314.

OAK CREEK. OAK CREEK MINE.

Sample.—Bituminous coal; Yampa field: (Denver No. 32; Ann Arbor No. 4) analyses Nos. 916–D, 915–D (p. 81).

Mine.—Oak Creek; a slope mine at Oak Creek south of Eddy, on the Denver, Northwestern & Pacific Railroad.

Coal bed.—Yampa (?). Cretaceous age, Mesaverde formation. Thickness, fairly uniform.

The bed was measured and sampled at two points by K. M. Way in 1909, as described below:

Section of coal bed in Oak Creek mine at Oak Creek.

Section	A		B	
Laboratory No.	916–D		915–D	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	6½	0	6¾
Shale	0	¼	0	½
Coal	1	6½	1	7½
Hard shale[a]	0	10	0	10
Coal	2	7½	2	9¾
Floor, shale.				
Thickness of bed	5	6¾	5	10½
Thickness of coal sampled	4	8¾	5	½

[a] Not included in sample.

Section A (sample 916–D) was measured in the face of the main slope, 725 feet northwest of the slope mouth.

Section B (sample 915–D) was measured in the face of the south slope, 700 feet northwest of the mouth.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 57; illuminating gas tests: Bureau of Mines Bull. 6, pp. 37, 47.

For chemical analyses see part I of this bulletin, p. 81; also Bureau of Mines Bull. 5, p. 26.

For geologic relations see U. S. Geol. Survey Bull. 297, p. 47.

OAK CREEK. SHUSTER MINE.

Sample.—Bituminous coal; Yampa field; analysis No. 1799 (p. 81).

Mine.—Shuster; on Oak Creek, 7 miles south of Eddy, 9 miles north of Yampa, in sec. 30, T. 4 N., R. 85 W., on the Denver, Northwestern & Pacific Railroad.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Dip, 20° NW.

The bed was measured and sampled by Campbell and Gale in July, 1905, as shown below:

Section of coal bed in the Shuster mine on Oak Creek.

Laboratory No.	1799	
	Ft.	*in.*
Coal[a]	3	3
Shale[a]	1	6
Coal	1	11
Clay[a]	0	1
Coal	4	9½
Thickness of bed	11	6½
Thickness of coal sampled	6	8½

[a] Not included in sample.

The sample was obtained about 50 feet from the entrance of the mine.

Since the date of sampling the railroad has been built and now an extensive mine has been opened at this place.

For chemical analyses of this coal, see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 285, p. 229; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 43.

POOL. McCROSKEY MINE.

Sample.—Bituminous (?) coal; Yampa field; analyses Nos. 1843, 1991 (p. 81).

Mine.—McCroskey; 1 mile south of Pool in sec. 9, T. 6 N., R. 86 W. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled for sample No. 1843 in 1905 by N. M. Fenneman. Sample No. 1991 was taken in 1905 by H. S. Gale.

Section of coal bed in McCroskey's mine, 1 mile south of Pool.

Laboratory No.	1843, 1991	
	Ft.	*in.*
Bony coal	3	0
Coal[a]	4	8
Bony coal	0	6
Clay	0	3½
Coal[a] [b]	3	11
Bony coal	1	0
Thickness of bed	13	4½

[a] Included in sample No. 1843.

[b] Included in sample No. 1991.

Note.—The lower bench was reported to be good blacksmithing coal.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 285, p. 229; Bull. 297, p. 84; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 52.

QUAKER MOUNTAIN. EGERIA MINE.

Sample.—Subbituminous coal; Yampa field; analysis No. 3436 (p. 81).

Mine.—Egeria; in Quaker Mountain, in sec. 26, T. 9 N., R. 87 W. No railroad connection.

Coal bed.—No name. Cretaceous age, "Laramie" formation. Dip, 1° W.

The bed was measured and sampled in July, 1906, by H. S. Gale. The sample represented 7 feet 3 inches of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 285, p. 239; Bull. 415, p. 248.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 297, p. 78.

SLATER. LUCKSINGER OPENING.

Sample.—Bituminous coal; Little Snake River field; analysis No. 6643 (p. 81).

Location.—Lucksinger opening; in the SE. ¼ NE. ¼ sec. 18, T. 12 N., R. 88 W., 5 miles east of Slater.

Coal bed.—Local one in the Mesaverde formation; Cretaceous age. It has not been traced for any great distance. Roof, coal; floor, highly bituminous shale.

The bed was measured and sampled by M. W. Ball in July, 1908. The sample represented 6 feet 10 inches of coal, the lower part of a bed 12 feet 2 inches thick.

The sample was taken from the breast of the main entry.

Notes.—The coal is hard and rather brittle with practically no cleavage along the bedding planes, is a good grade bituminous, and may be coking. It was mined for local use only.

For chemical analyses of this coal, see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 381, p. 200.

WELD COUNTY.

DACONO. GOLDEN ASH MINE.

Sample.—Subbituminous coal; Denver region; (Denver No. 13) analyses Nos. 350–D and 351–D (p. 81).

Mine.—Golden Ash; a shaft mine at Dacono, on the Union Pacific Railroad.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 5 to 9 feet, but 2 to 3 feet are left up for a roof in mining; roof, shale; floor, shale.

The bed was measured and sampled at two points by J. W. Groves on February 18, 1908. Section A (sample 350–D) included 5 feet 1 inch of coal; section B (sample 351–D) included 6 feet of coal.

Section A (sample 350–D) was measured in a crosscut from west entry 1, 1,100 feet west of the shaft.

Section B (sample 351–D) was measured in the main north entry, 1,100 feet north of the shaft.

Notes.—The commercial sizes produced in 1908 were lump, egg, and slack, 6-inch, 4½-inch, and 2½-inch screens with round perforations being used. The output of the mine in February, 1908, was 500 tons per day.

For chemical analyses of this coal, see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 368, p. 23.

EATON. STAR MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6406 (p. 81).

Mine.—Star; 1 mile east of Eaton, in sec. 32, T. 7 N., R. 65 W.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 2 feet 10½ inches.

The bed was measured and sampled by G. C. Martin on August 16, 1908, the sample representing 2 feet 10½ inches of coal.

The sample was taken 325 feet southeast of foot of shaft, 50 feet below the surface.

The sample was dry and fresh when taken.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

ERIE. IDEAL MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6374 (p. 81).

Mine.—Ideal; 3½ miles northeast of Erie, in sec. 33, T. 2 N., R. 68 W.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 8 feet, but only the lower 6 feet 3 inches was sampled.

The bed was measured and sampled by G. C. Martin in 1908, as shown below:

Section of coal bed in Ideal mine, 3½ miles northeast of Erie.

Laboratory No	6374	
	Ft.	*in.*
Coal [a]	1	9
Coal	6	3
Thickness of bed	8	0
Thickness of coal sampled	6	3

[a] Not included in sample.

The sample was taken 300 feet west of the foot of the slope, 100 feet below the surface When taken it was dry and fresh.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

ERIE. LEHIGH MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6841 (p. 81).

Mine.—Lehigh; 1 mile northeast of Erie, in sec. 19, T. 1, N., R. 68 W.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 5 feet 7 inches.

The bed was measured and sampled by G. C. Martin on October 24, 1908, the sample representing 5 feet 7 inches of coal.

The sample was taken at a point 750 feet north of the foot of the shaft, over 100 feet below the surface. It was dry and fresh when taken out.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 381, p. 302.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

FORT LUPTON. WARWICK MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6375 (p. 81).

Mine.—Warwick; 8 miles west of Fort Lupton, in sec. 30, T. 2 N., R. 67 W.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 8 feet 4 inches, with a parting.

The bed was measured and sampled by G. C. Martin in 1908, as shown below:

Section of coal bed in Warwick mine, 8 miles west of Fort Lupton.

Laboratory No.	6375	
	Ft.	*in.*
Coal[a]	2	8
Shale[a]	0	4
Coal, bony[a]	0	10
Parting	..	..
Coal	4	6
Thickness of bed	8	4
Thickness of coal sampled	4	6

[a] Not included in sample.

The sample was taken 165 feet south of the foot of the shaft, 115 feet below the surface. It was dry and fresh when taken.

For chemical analyses of this coal see part I of this bulletin, p. 81; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

GREELEY. WHITE ASH MINE.

Sample.—Subbituminous (?) coal; Denver region; analysis No. 6371 (p. 82).

Mine.—White Ash; 13 miles southeast of Greeley, sec. 24, T. 4 N., R. 65 W.

Coal bed.—The coal is of Cretaceous age, Laramie formation. Thickness, 2 feet 8½ inches.

The bed was sampled and measured by G. C. Martin in 1908, as shown below:

Section of coal bed in White Ash mine, 13 miles southeast of Greeley.

Laboratory No.	6371	
	Ft.	*in.*
Bony coal	0	2
Coal	2	6½
Thickness of bed	2	8½
Thickness of coal sampled	2	8½

The sample was taken 700 feet northwest of the foot of the shaft. It was dry and fresh.

For chemical analyses of this coal see part I of this bulletin, p. 82; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

GREELEY. FARMER'S MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6373 (p. 82).

Mine.—Farmer's; 13 miles southeast of Greeley, in sec. 24, T. 4 N., R. 65 W.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 2 feet 8 inches.

The bed was measured and sampled by G. C. Martin on August 5, 1908, the sample representing 2 feet 8 inches of coal. It was taken 500 feet south of foot of shaft and 70 feet below the surface. The sample was dry and fresh when taken.

For chemical analyses of this coal see part I of this bulletin, p. 82; also U. S. Geol. Survey Bull. 381, p. 300.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

IDAHO CREEK. PURITAN MINE.

Sample.—Subbituminous coal; Denver region; analysis No. 6842 (p. 82).

Mine.—Puritan; 5 miles southeast of Idaho Creek, 5 miles northeast of Erie, in sec. 34, T. 2 N., R. 68 W.

Coal bed.—Main bed. Cretaceous age, Laramie formation. Thickness, 10 feet 5 inches.

The bed was measured and sampled by G. C. Martin in 1908, as shown below:

Section of coal bed in Puritan mine, 5 miles southeast of Idaho Creek.

Laboratory No.	6842	
	Ft.	*in.*
Coal[a]	2	4
Coal	8	1
Thickness coal bed	10	5
Thickness of coal sampled	8	1

[a] Not included in sample.

The sample was collected at a point 175 feet west of the foot of the shaft, 110 feet below surface. It was dry and fresh when taken out.

For chemical analyses of this coal see part I of this bulletin, p. 82; also U. S. Geol. Survey Bull. 381, p. 302.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

PLATTEVILLE. PLATTEVILLE MINE.

Sample.—Subbituminous coal; Denver region; analyses Nos. 6407, 6408 (p. 82).

Mine.—Platteville; in sec. 29, T. 3 N., R. 66 W., Platteville.

Coal bed.—Cretaceous age, Laramie formation. Thickness, 5 feet.

The bed was measured and sampled by G. C. Martin on August 19, 1908, as shown below:

Section of cocl bed in Platteville mine, at Platteville.

Laboratory No.	6407, 6408	
	Ft.	*in.*
Coal, upper bench (sample 6408)	2	4
Bone and coal	1	7
Coal, lower bench (sample 6407)	1	1
Thickness of bed	5	0

The samples were taken 200 feet west of the foot of the shaft 50 feet below the surface. It was dry and fresh when taken.

For chemical analyses of this coal see part I of this bulletin, p. 82; also U. S. Geol. Survey Bull. 381, p. 301.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 297.

GEORGIA.

CHATTOOGA COUNTY.

MENLO. LOOKOUT MINE.

Sample.—Semibituminous coal; (Georgia No. 1) analyses Nos. 4155, 4156 (p. 82).

Mine.—Lookout; a drift mine 7 miles northwest of Menlo on the Chattanooga Southern Railroad.

Coal bed.—Known locally as the Little River. Carboniferous age, Pottsville formation. Thickness, fairly uniform, averaging 23 inches; roof, massive gray shale; floor, blackjack, impure coal, 4 to 8 feet thick, underlain with fire clay.

The bed was measured and sampled at two points by J. W. Groves and K. M. Way, November 9, 1906, as described below:

Sections of coal bed in Lookout mine, 7 miles northwest of Menlo.

Section	A		B	
Laboratory No.	4155		4156	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	9	0	8½
Shale [a]	0	¾	0	1
Coal	1	2½	1	1½
Floor, blackjack.				
Thickness of bed	2	¼	1	11
Thickness of coal sampled	1	11½	1	10

[a] Not included in sample.

Section A (sample 4155) was measured 1,600 feet east of the drift mouth, east entry 1½.

Section B (sample 4156), was measured 2,800 feet east of the drift mouth, east entry 3.

Note.—The rated capacity of the mine in 1906 was 250 tons per day.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests: U. S. Geol. Survey Bull. 332, p. 79; Bureau of Mines Bull. 23, pp. 59, 147; coking tests: U. S. Geol. Survey Bull. 332, p. 79; Bull. 336, pp. 21, 28, 37.

For chemical analyses see part I of this bulletin, p. 82; also U. S. Geol. Survey Bull. 332, p. 78.

IDAHO.

CASSIA COUNTY.

BURLEY. WORTHINGTON MINE.

Sample.—Subbituminous (?) coal; analysis No. 3207 (p. 82).

Mine.—Worthington; in sec. 26, T. 16 S., R. 20 E., on Goose Creek, 25 miles from Burley.

The bed was measured and sampled by Victor C. Heikes. The sample was taken from a 4-foot 2-inch cut, which represented the thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 82.

ILLINOIS.

CLINTON COUNTY.

GERMANTOWN. SOUTHERN NO. 10 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 25) analyses Nos. 2856, 2857 (p. 83).

Mine.—Southern No. 10; a shaft mine one-half mile east of Germantown on the Southern Railway.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Thickness, 4 to 5 feet, averaging 4 feet 8 inches; roof, black shale; floor, hard black shale; shaft, 345 feet deep. Thin layers of shale and streaks and lenses of pyrite constitute the impurities in the bed.

Two sections in the mine were measured and sampled by J. W. Groves and W. J. von Borries on February 2, 1906, as shown below:

Sections of coal bed in Southern No. 10 mine, at Germantown.

Section	A		B	
Laboratory Nos	2856		2857	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	2	1	4
Shale	[a]0	½	0	⅛
Coal	0	11	1	1
Shale (local)	0	⅛	..	..
Shale	..	..	0	¼
Coal	1	7	1	8
Blackjack	0	½	[a]0	1¼
Coal	1	1½	0	4½
Sulphur	0	⅛	..	..
Coal	0	8	..	..
Shale and sulphur	[a]0	½	..	..
Coal	0	1½	..	..
Floor, shale.				
Thickness of section	4	8¾	4	7⅛
Thickness of coal sampled	4	7¾	4	5⅞

[a] Not included in sample.

Section A (sample 2856) was measured in the back north entry, 2,100 feet north of the shaft.

Section B (sample 2857) was measured in the sixth west entry, 2,200 feet northwest of the shaft.

Note.—The coal at this mine is hard and firm.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 101; Bureau of Mines Bull. 23, pp. 61, 157; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 101; Bureau of Mines Bull. 13, pp. 121, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 102; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 332, p. 102; Bull. 336, pp. 22, 28, 38.

For chemical analyses see part I of this bulletin, p. 83; also U. S. Geol. Survey Bull. 332, p. 100.

NEW BADEN. SOUTHERN NO. 9 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 24) analyses Nos. 2854, 2855 (p. 83).

Mine.—Southern No. 9, a shaft mine at New Baden, on the Southern Railway.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. It here lies nearly horizontal, with a general northeast dip. Its average thickness at this mine is 7 feet 6 inches. The roof is limestone and black shale, the shale where present underlying the limestone; the floor is a hard, fine, gray clay. Depth of shaft, 320 feet.

Two sections were measured and sampled by J. W. Groves and W. J. von Borries on February 1, 1906, as noted below:

Sections of coal bed in Southern mine No. 9, near New Baden.

Section	A		B	
Laboratory No.	2854		2855	
	Ft.	*in.*	*Ft.*	*in.*
Roof shale.				
Top coal	[a] 0	8	[a] 1	2
Coal	1	8	..	..
Sulphur	0	⅛	0	⅛
Coal	0	8	1	10
Blackjack	0	¾	0	½
Coal	0	3	1	6
Mother coal	0	⅛	..	..
Shale and sulphur	..	..	0	¼
Coal	0	5	1	5
Sulphur	0	⅛	[a] 0	1
Coal	0	5	0	5
Mother coal	0	¼	..	..
Blue band and sulphur	..	..	[a] 0	1½
Coal	0	10	1	5
Sulphur	0	⅛	..	..
Coal	1	8	..	..
Blue band	[a] 0	1½	..	..
Coal	0	6	..	..
Sulphur	0	⅛	..	..
Coal	0	6	..	..
Blackjack	[a] 0	1	..	..
Coal	0	4	..	..
Floor, fire clay.				
Thickness of section	8	3⅛	8	⅜
Thickness of coal sampled	7	5⅝	6	7⅞

[a] Not included in sample.

Section A (sample 2854) was measured in an entry 400 feet northwest of the shaft, in north entry 1, off west entry 1.

Section B (sample 2855) was measured in a room 600 feet northeast of the shaft, in room 4, off east entry 1, off north entry 1.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 98; Bureau of Mines Bull. 23, pp. 61, 157; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 99; Bureau of Mines Bull. 13, pp. 121, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 99; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 99; Bull. 336, pp. 22, 28, 38.

For chemical analyses see part I of this bulletin, p. 83; also U. S. Geol. Survey Bull. 332, p. 98.

TRENTON. SOUTH TRENTON MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 33) analyses Nos. 4384, 4385 (p. 83).

Mine.—South Trenton; at Trenton, on the Baltimore & Ohio Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Roof, 1 foot of coal, with clod and about 1 foot of coal above; floor, fire clay.

The bed was measured and sampled at two points by K. M. Way, January 1, 1907, as shown below:

Sections of coal bed in South Trenton mine at Trenton.

Section	A		B	
Laboratory No.	4384		4385	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Coal	3	7½	3	1
Blue band [a]	0	1¼	0	2¾
Coal	0	4	0	4
Sulphur	0	¼	..	..
Blue band	0	0	0	1½
Coal	1	5½	1	5
Floor, fire clay.				
Thickness of bed	5	6½	5	2¼
Thickness of coal sampled	5	5¼	4	11½

[a] Not included in sample.

Section A (sample 4384) was measured 1,800 feet west of the shaft in room 5, south entry 2, off east entry 10.

Section B (sample 4385) was measured 2,000 feet northwest of the shaft in room 1, north entry 7, off west entry 5.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 121; Bureau of Mines Bull. 23, pp. 61, 159; briquetting tests: U. S. Geol. Survey Bull. 332, p. 121.

For chemical analyses see part I of this bulletin, p. 83; also U. S. Geol. Survey Bull. 332, p. 121.

FRANKLIN COUNTY.

BENTON. BENTON MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 13) analyses Nos. 1694, 1695 (p. 83).

Mine.—Benton; Big Muddy district; a shaft mine at Benton, on the Chicago & Eastern Illinois Railroad.

Coal bed.—Herrin coal (No. 6) of the United States Geological Survey, locally designated as the Big Muddy. Carboniferous age, Carbondale formation. It lies nearly horizontal. Shaft, 630 feet deep. The bed is 6 to 10 feet thick, averaging 9 feet. It has a rather weak roof of hard blue shale, and a floor of medium hard gray shale.

The following sections were measured and sampled by J. W. Groves in 1905:

Sections of coal bed in Benton mine at Benton.

Section	A		B	
Laboratory No	1695		1694	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	1	3	1
Shale, local	0	¼	..	..
Mother coal, hard	..	..	0	¾
Coal	2	7	0	8½
Sulphur [a]	0	¼	..	..
Mother coal, soft	..	..	0	½
Coal	1	0	1	2
Mother coal	..	..	0	¼
Mother coal, local	0	¾	..	..
Coal	1	11¾	1	6½
Mother coal	..	..	0	¼
Coal	..	..	0	7¼
Blue band (shale) [a]	0	1½	..	..
Mother coal	..	..	0	⅜
Coal	1	7¼	0	6¾
Blue band (shale) [a]	..	..	0	1
Coal	..	..	0	4
Blue band (shale) [a]	..	..	0	¾
Coal	..	..	1	9
Floor, fire clay.				
Thickness of section	9	3¾	10	⅞
Thickness of coal sampled	9	2	9	11⅛

[a] Not included in sample.

Section A (sample 1694) was measured in the main entry 100 feet north of the shaft.

Section B (sample 1695) was measured in the main entry 80 feet south of the shaft.

The two blue bands in section B come together 6 feet from the point at which the section was measured.

Notes.—The coal from this mine, like that from others in this field, is hard and firm. There are local shale partings and "sulphur" nodules, but no regular partings. In 1905 the mine was new and had no definite rating.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 77; Bureau of Mines Bull. 23, pp. 60, 152; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 78; Bureau of Mines Bull. 13, p. 113; washing tests: U. S. Geol. Survey Bull. 290, p. 79; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 79; Bull. 336, pp. 21, 28, 37; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 83; also U. S. Geol. Survey Bull. 290, p. 77.

SESSER. KELLER MINE.

Sample.—Bituminous coal; Illinois field; (Denver No. 15) analyses Nos. 477–D, 478–D (p. 83).

Mine.—Keller; a shaft mine at Sesser, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Herrin coal (No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform.

The bed was measured and sampled at two points by J. W. Groves on August 7, 1908, as described below:

Section of coal bed in Keller mine at Sesser.

Section	A		B	
Laboratory No	477–D		478–D	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	7	3	10
Rash	0	1	..	..
Coal	3	9	..	..
Shale[a]	0	1½	0	¾
Coal	0	8	0	8
Blue band[a]	0	1½	0	1¼
Coal	1	7	..	..
Thickness of bed	6	11	6	8
Thickness of coal sampled	6	8	6	6

[a] Not included in sample.

Section A (sample 477–D) was measured 980 feet northwest of the shaft.

Section B (sample 478–D) was measured 1,220 feet north of the shaft.

For results of coking tests of this coal see Bureau of Mines Bull. 5, pp. 32, 40.

For chemical analyses see part I of this bulletin, p. 83.

ZEIGLER. ZEIGLER MINE.

Sample.—Bituminous coal; Illinois field; analyses Nos. 1871, 1872, and 3408 (Illinois No. 19), and analyses Nos. 5214, 5237 (p. 84).

Mine.—Zeigler; a shaft mine at Zeigler, on the Illinois Central Railroad.

Coal bed.—Herrin coal (No. 6) of the United States Geological Survey, locally called the Big Muddy. Carboniferous age, Carbondale formation. Thickness, fairly uniform, being in this mine from 10 to 12 feet, averaging 11 feet; roof, dark massive shale, which falls as rooms are worked out; floor, medium-hard light-gray shale, with fire clay in places. Shaft 420 feet deep.

The bed was measured and sampled at two points (sections A and B) by J. W. Groves and W. J. von Borries on July 20, 1905, and at another point (section C) by J. W. Groves and J. H. Robison on July 6, 1906. The sections were as follows:

Sections of coal bed in Zeigler mine at Zeigler.

Section	A		B		C	
Laboratory No	1871		1872		3408	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal[a]	4	0	4	0	..	..
Coal	0	8	0	8	3	2
Blue band[b]	..	..	..	..	0	1
Mother coal and shale	0	⅛	0	⅛	..	..
Coal	0	11	0	11	2	0
Mother coal	..	..	..	..	0	½
Shale	0	1/16	0	1/16	..	..
Coal	3	8	3	8	2	0
Blue band[b]	0	1	0	1	0	½
Coal	2	6	2	6	3	10
Floor, shale.						
Thickness of bed	11	10 3/16	11	10 3/16	11	2
Thickness of coal sampled	7	10 3/16	7	10 3/16	11	2

[a] Not included in sample.

[b] The blue band was included in sampling, as it was loaded with the coal. It burns readily to ash. It is from ½ to 1½ inches thick.

Section A (sample 1871) was measured in room 5, off west entry 1, on the north side of the mine, 680 feet northwest of the shaft.

Section B (sample 1872) was measured in room 5, off west entry 3, on the south side of the mine, 1,050 feet southwest of the shaft.

Section C (sample 3408) was measured in room 6, on west entry 3, 1,500 feet southwest of the shaft.

The bed was also measured and sampled at two points by G. S. Pope in 1908.

Sample 5214 was taken 1,600 feet south and 475 feet east of opening, east entry 6, off right entry 1, south side, and represented 7 feet 7½ inches of coal.

Sample 5237 was taken 1,000 feet north and 550 feet west of opening, west entry 2, off right entry 1, north face, and represented a cut of 7 feet 5 inches.

Notes.—The coal from this mine, like that from many others in this field, is bright and brittle. In this mine the bed contains little shale or pyrite. In 1905 the tipple was equipped with 3-inch, 1½-inch, and ¾-inch screens with round perforations. The larger part of the product was shipped to Chicago.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 92; Bull. 332, p. 85; Bureau of Mines Bull. 23, pp. 60, 154; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 93; Bull. 332, p. 86; Bureau of Mines Bull. 13, pp. 115, 273; coking tests: U. S. Geol. Survey Bull. 290, p. 94; Bull. 336, pp. 22, 37.

For chemical analyses see part I of this bulletin, pp. 84, 85; also U. S. Geol. Survey Bull. 290, p. 91; Bull. 332, p. 85.

FULTON COUNTY.

ST. DAVID. BIG CREEK NO. 2 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 32) analyses Nos. 4345, 4346 (p. 85).

Mine.—Big Creek No. 2; a drift mine, at St. David, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Springfield coal (No. 5) of the United States Geological Survey. Carboniferous age, Carbondale formation. Thickness, uniform (?); roof, gray shale, 18 inches to 2½ feet thick; floor, fire clay.

The bed was measured and sampled at two points by K. M. Way on December 12, 1906, as described below:

Section of coal bed in Big Creek No. 2 mine at St. David.

Section	A		B	
Laboratory No	4346		4345	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	3	½	2	0
Sulphur	0	¼	0	⅛
Coal	1	7¾	0	6
Blackjack	[a] 0	1	0	⅛
Shale	[a] 0	2	..	..
Coal	..	..	1	10¼
Blackjack	..	..	[a] 0	1
Shale	..	..	[a] 0	2¼
Floor, fire clay.				
Thickness of bed	4	9½	4	7¾
Thickness of coal sampled	4	5½	4	4½

[a] Not included in sample.

Section A (sample 4346) was measured in north entry 10, off west entry 2, 2,500 feet west of the drift mouth.

Section B (sample 4345) was measured 2,200 feet northwest of the drift mouth.

For chemical analyses of this coal see part I of this bulletin, p. 85.

LA SALLE COUNTY.

La Salle. La Salle Mine.

Sample.—Bituminous coal; Illinois field; (Illinois No. 18) analyses Nos. 1741, 1742 (p. 85).

Mine.—La Salle; La Salle district; a shaft mine in the suburbs of La Salle, on the Illinois Central Railroad.

Coal bed.—No. 2, supposed to be the Murphysboro coal of the United States Geological Survey. Carboniferous age, Carbondale formation.

At this mine the bed lies flat, with differing local dips, and is worked on the long-wall advancing system through a shaft 420 feet. The bed is from 3 to 5 feet thick, averaging 3 feet 6 inches. It has a roof of massive black to gray shale, and a floor of clay shale of varying hardness. In places the shale floor is rough and some of it may be shoveled up in loading mine cars. In mining, the undercutting is usually done in the clay shale below the coal. In places the coal is softer than the shale, and the undercutting is then done in the coal.

Two sections were measured and sampled at widely separated points in the mine by J. W. Groves and J. S. Burrows on June 21, 1905, as noted below:

Sections of coal bed in La Salle shaft mine at La Salle.

Section	A		B	
Laboratory No	1741		1742	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4	0	8
Mother coal	0	⅛	..	..
Sulphur[a]	..	..	0	1¼
Coal	0	5	2	10
Blackjack (shale and coal)	0	¼	..	..
Coal	1	6	..	..
Floor, shale.				
Thickness of section	3	3⅜	3	7¼
Thickness of coal sampled	3	3⅜	3	6

[a] Not included in sample.

Section A (sample 1741) was cut in west entry 12 off the north entry, at a point 4,000 feet north of the shaft.

Section B (sample 1742) was cut in east entry 3 off south entry 3, 4,000 feet southeast of the shaft.

Notes.—The coal from this mine, like that from others working the bed, is hard and brittle. The bed carries streaks of "sulphur" and shale, but no regular partings. The output was used chiefly for steam production. In 1905, the sizes made were: Lump, engine coal, nut, slack, duff, and that which passed through a ⅜-inch screen. The larger part of the product was shipped to Chicago. The duff was used in a cement plant at La Salle.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 89; Bureau of Mines Bull. 23, pp. 60, 153; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 90; Bureau of Mines Bull. 13, pp. 114, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 91; Bull. 336, p. 12.

For chemical analyses see part I of this bulletin, p. 85; also U. S. Geol. Survey Bull. 290, p. 88.

LOGAN COUNTY.

Lincoln. Latham Mine.

Sample.—Bituminous coal; Illinois field; (Illinois No. 26) analyses Nos. 2881, 2882 (p. 85).

Mine.—Latham, a shaft mine 1 mile north of Lincoln, on the Chicago & Alton Railroad.

Coal bed.—No. 5 (Springfield coal of the United States Geological Survey). Carboniferous age, Carbondale formation. Thickness, variable, in this mine 4 to 6 feet, averaging 4 feet, 8 inches; dip ⅜ inch in 160 inches to northwest, or ⅝ of a degree; roof, mostly hard laminated black shale, containing in places many concretions; in places the roof is sandy shale; floor, hard gray shale, called fire clay. The mine shaft is 276 feet deep.

The bed was measured and sampled at two points by J. S. Burrows and W. J. von Borries on February 7, 1906, as described below:

Section of coal bed in Latham mine, 1 mile north of Lincoln.

Section	A		B	
Laboratory No	2881		2882	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4½	0	10
Shale [a]	0	¾	..	..
Sulphur [a]	..	..	0	½
Coal	0	9	3	6
Sulphur	0	⅛	0	⅛
Coal	3	8	0	6
Floor, shale.				
Thickness of bed	4	10⅜	4	10⅝
Thickness of coal sampled	4	9⅝	4	10⅛

[a] Not included in sample.

Section A (sample 2881) was measured 1,500 feet southeast of the shaft in room 11 off the third south stub entry.

Section B (sample 2882) was measured 1,600 feet northeast of the shaft in room 1, main entry 3, off the main cross entry, northwest side.

Notes.—The coal from this mine, like that from many others in this field, is hard tough and firm. The bed has no regular partings but contains some lenticular streaks and layers of pyrite and shale.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 103; Bureau of Mines Bull. 23, pp. 61, 157; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 104; Bureau of Mines Bull. 13, p. 121, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 104; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 104; Bull. 336, pp. 22, 28, 38.

For chemical analyses see part I of this bulletin, p 85; also U. S. Geol. Survey Bull. 332, p. 103.

McLEAN COUNTY.

Chenoa. Chenoa Mine.

Sample.—Bituminous coal; Illinois field; (special samples) analyses Nos. 3044, 3045 (p. 85).

Mine.—Chenoa; at Chenoa.

Coal bed.—Probably the Murphysboro (No. 2). The coal is of Carboniferous age; Carbondale formation.

The bed was measured and sampled by J. W. Groves on March 23, 1906.

Sample 3044 was taken in room No. 1, off east entry 1, off north entry, 300 feet northeast of shaft, and represented a 43-inch cut.

Sample 3045 was taken in room 6, off west entry 4, off north entry, 250 feet northwest of shaft, and represented a 3½-foot cut.

For chemical analyses of this coal see part I of this bulletin, p. 85.

MACOUPIN COUNTY.

STAUNTON. NO. 2 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 9) analyses Nos. 1625, 1626 (p. 85).

Mine.—No. 2; a shaft mine near Staunton, on the Litchfield & Madison Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. The bed contains streaks of shale and sulphur. In places the roof is sandstone and in places there is hard clay beneath the sandstone. The floor is a hard fire clay.

Two samples were collected by J. S. Burrows on May 12, 1905, at point where measurements showed the following sections:

Sections of coal bed in No. 2 mine near Staunton.

Section	A		B	
Laboratory No.	1625		1626	
Roof: section A, sandstone; section B, sandstone and clay.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11	1	1¾
Fire clay, carboniferous	0	¼	..	..
Sulphur	..	..	..	..
Coal	1	9	1	8
Sulphur	0	¼	..	..
Coal	0	6½	2	10½
Brash	..	..	0	¾
Sulphur	0	⅛	..	..
Coal	0	11	..	..
Sulphur	0	¼	..	..
Coal	1	5	0	3
Sulphur	0	¼	..	..
Shale binder	..	..	[a] 0	1
Coal	0	5	0	10¼
Shale binder	[a] 0	1½	..	..
Coal	0	9	..	..
Floor, fire clay.				
Thickness of bed	6	11⅛	6	11¼
Thickness of coal sampled	6	9⅝	6	10¼

[a] Not included in sample.

Section A (sample 1625) was measured in room 11, off north entry 1.

Section B (sample 1626) was measured in the face of the main air course.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 63; Bull. 332, p. 81; Bureau of Mines Bull. 23, pp. 59, 149; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 65; Bureau of Mines Bull. 13, pp. 111, 115, 272; briquetting tests: U. S. Geol. Survey Bull. 332, p. 82; washing tests: U. S. Geol. Survey Bull. 290, p. 66; Bull. 336, p. 12.

For chemical analyses see part I of this bulletin, p. 85; also U. S. Geol. Survey Bull. 290, p. 63; Bull. 332, p. 81.

MADISON COUNTY.

COLLINSVILLE. LUMAGHI NO. 2 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 7) analyses Nos. 1608–A, 1609 (p. 86).

Mine.—Lumaghi No. 2; a shaft mine in the Big Muddy district near Collinsville, on the Vandalia Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. The bed is mined by a shaft 80 feet deep. The coal has an average thickness of 6 feet and no regular partings. It is tough and firm and contains small streaks of shale and sulphur. The roof is uneven, but extremely good, a massive black shale The floor is firm black shale from 1 to 2 feet thick; below the shale is fire clay.

Two samples were taken by J. S. Burrows on April 18, 1905, from points where the following sections were measured.

Sections of coal bed in Lumaghi No. 2 mine near Collinsville.

Section	A		B	
Laboratory No	1608		1609	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	8	2	2	10
Sulphur knife edge	..	..	..	..
Coal	..	..	0	2
Sulphur knife edge	..	..	..	..
Coal	..	..	3	4
Clay shale [a]	..	..	..	..
Coal	..	..	1	7
Floor, shale.				
Thickness of bed	8	2	7	11
Thickness of coal sampled	8	2	7	11

[a] Not included in sample.

Section A (sample 1608) was measured in room 17 of the north entry.

Section B (sample 1609) was measured in room 14 of the south entry.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 58; Bull. 332, p. 80; Bureau of Mines Bull. 23, pp. 59, 148; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 59; Bureau of Mines Bull. 13, pp. 110, 272; briquetting tests: U. S. Geol. Survey Bull. 332, p. 80; washing tests: U. S. Geol. Survey Bull. 290, p. 60; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 60; Bull. 336, pp. 21, 28, 37.

For chemical analyses, see part I of this bulletin, p. 86; also U. S. Geol. Survey Bull. 290, p. 57; Bull. 332, p. 80.

DONKVILLE. NO. 1 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 23) analyses Nos. 2774, 2775 (p. 87).

Mine.—No. 1; a shaft mine at Donkville, on the St. Louis, Troy & Eastern Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. At this mine nearly horizontal, with a general dip northeast. Average thickness at this mine, 6 feet. The bed has a roof of limestone, and a floor of gray fire clay. Shale and pyrites occur as thin laminæ in the coal. The shaft is 145 feet deep.

Two sections of the bed were measured and sampled by J. W. Groves and W. J. von Borries on January 15, 1906, as shown below:

Sections of coal bed in No. 1 mine at Donkville.

Section	A		B	
Laboratory No	2774		2775	
Roof, limestone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	2	0
Sulphur	0	⅛	..	..
Shale	..	..	0	½
Coal	0	10	1	0
Sulphur	0	⅛	..	..
Coal	0	7	..	..
Shale	[a] 0	¼	[a] 0	1
Coal	2	2	1	10
Shale	..	..	[a] 0	½
Sulphur	[a] 0	1	..	..
Coal	0	5	[a] 0	2
Shale and sulphur	..	..	[a] 0	2
Blue band (shale)	[a] 0	1½	..	..
Coal	1	0	1	0
Floor, fire clay.				
Thickness of section	5	11	6	4
Thickness of coal sampled	5	8¼	3	10½

[a] Not included in sample.

Section A (sample 2774) was measured in north entry 5 off east entry 6, 3,800 feet northeast of the shaft.

Section B (sample 2775) was measured in north entry 5 off west entry 6, 4,000 feet northwest of the shaft.

Notes.—The coal worked at this mine is hard and firm; the bed has prominent face and butt joints. The tipple in 1905 was equipped with 5-inch, 2-inch, and 1¼-inch screens. The coal under 2 inches in size was washed.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 95; Bureau of Mines Bull. 23, pp. 61, 156, 157; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 96; Bureau of Mines Bull. 13, pp. 119, 273; briquetting tests: U. S. Geol. Survey Bull. 332, p. 97; washing tests: U. S. Geol. Survey Bull. 332, p. 93; Bull. 336, pp. 13, 14; coking tests: U. S. Geol. Survey Bull. 332, p. 97; Bull. 336, pp. 22, 28, 37.

For chemical analyses, see part I of this bulletin, p. 87; also U. S. Geol. Survey Bull. 332, p. 95.

LIVINGSTON. NEW STAUNTON MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 29) analyses Nos. 3911, 3913 (p. 87).

Mine.—New Staunton; a shaft mine at Livingston, on the Cleveland, Cincinnati, Chicago & St. Louis Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform at this mine, averaging 6 feet 10 inches; roof, gray shale; floor, fire clay. The shaft is 286 feet deep.

The bed was measured and sampled at two points by J. W. Groves and K. M. Way on October 9, 1906, as described below:

Sections of coal bed in New Staunton mine at Livingston.

Section	A		B	
Laboratory No.	3911		3913	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	11	0	7
Sulphur	0	⅛	..	..
Mother coal and sulphur	..	..	0	¼
Coal	1	0	1	1
Shale	[a] 0	½	..	..
Coal	0	3½	..	..
Sulphur	[a] 0	¼	0	⅛
Coal	..	..	0	10
Shale	..	..	[a] 0	1
Coal	0	6	0	5
Mother coal	0	⅛	..	..
Sulphur	..	..	[a] 0	⅛
Coal	1	2	1	2
Mother coal	0	¾	0	¼
Coal	0	8	1	0
Sulphur	[a] 0	¾	0	½
Coal	0	4	0	5
Blue band	[a] 0	½	..	..
Shale	..	..	[a] 0	1½
Coal	0	11	0	10
Floor, fire clay.				
Thickness of section	7	1½	6	6¾
Thickness of coal sampled	6	10½	6	4⅝

[a] Not included in sample.

Section A (sample 3911) was measured 1,600 feet south of the shaft in room off south entry 6.

Section B (sample 3913) was measured in room off the back west entry, 1,200 feet northwest of the shaft.

Note.—The rated capacity of the mine in 1906 was 2,000 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 111; Bureau of Mines Bull. 23, pp. 61, 158, 159; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 112; Bureau of Mines Bull. 13, pp. 122, 273; briquetting tests: U. S. Geol. Survey Bull. 332, p. 114; washing tests: U. S. Geol. Survey Bull. 332, p. 112; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 112; Bull. 336, pp. 22, 28, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 72, 74; Bull. 332, p. 113.

For chemical analyses of this coal see part I of this bulletin, p. 87.

MARYVILLE. NO. 2 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 22) analyses Nos. 2772, 2773 (p. 87).

Mine.—No. 2; a shaft mine at Maryville, on the St. Louis, Troy & Eastern Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Its general dip at this mine is northeast. It is from 7 to 11 feet thick at this mine, averaging 8 feet. The bed has a hard shale roof, and a floor of fire clay and hard gray shale. Sulphur and shale in regular layers and in lenses are the impurities of the bed.

Two sections were measured and sampled by J. W. Groves and W. J. Von Borries on January 13, 1906, as noted below:

Sections of coal bed in No. 2 mine at Maryville.

Section	A		B	
Laboratory No.	2772		2773	
Roof: shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	7	1	4½
Sulphur	[a] 0	⅛	..	..
Shale	..	..	[a] 0	⅛
Coal	0	10	1	1
Sulphur and shale	[a] 0	¾	..	..
Sulphur	..	..	[a] 0	⅛
Coal	0	8	0	10½
Shale	[a] 0	¼	..	..
Sulphur	..	..	[a] 0	⅛
Coal	0	5	0	10½
Sulphur	[a] 0	⅛	..	..
Shale	..	..	[a] 0	¾
Coal	0	10	1	4
Shale and sulphur	[a] 0	¼	[a] 0	1
Coal	1	5	0	6
Sulphur	[a] 0	½	..	..
Shale	..	..	[a] 0	1
Coal	0	6	1	11
Sulphur	[a] 0	¼	..	..
Coal	1	10	..	..
Floor, sec. A, fire clay; sec. B, shale.				
Thickness of section	8	3¼	8	2⅝
Thickness of coal sampled	8	1	7	11½

[a] Not included in sample.

Section A (sample 2772) was measured in the main south entry, 3,000 feet south of the shaft.

Section B (sample 2773) was measured in east entry 9, 2,500 feet north of the shaft.

Notes.—In 1905, the sizes produced were lump, egg, pea, and slack by 5-inch, 2-inch, 1¼-inch, and ¾-inch screens. The estimated output was 1,700 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 92; Bureau of Mines Bull. 23, pp. 61, 156; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 93; Bureau of Mines Bull. 13, pp. 119, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 93; Bull. 336, p. 13; coking tests: U. S. Geol. Survey Bull. 332, p. 93; Bull. 336, pp. 22, 28, 37; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74; Bull. 332, p. 94.

For chemical analyses see part I of this bulletin, p. 87; also U. S. Geol. Survey Bull. 332, p. 92.

TROY. NO. 3 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 4) analyses Nos. 1341, 1342 (p. 87).

Mine.—No. 3, a shaft mine about 1 mile west of Troy, on a private railroad, the St. Louis, Troy & Eastern.

Coal bed.—Herrin coal (Belleville, No. 6.) It is the principal coal in Madison and St. Clair Counties. It lies nearly horizontal at this mine, and is worked by a shaft 273 feet deep. The bed has an excellent roof; the top bone is generally left in place.

Two samples were taken by M. R. Campbell on October 31, 1904, at points which showed the following section:

Sections of coal bed in No. 3, mine 1 mile west of Troy.

Section	A		B	
Laboratory No	1341		1342	
Roof, bone coal.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	4	0	3
Coal	0	5½	0	9
Shale	0	¼	..	..
Shale, knife edge	..	..	..	..
Coal	3	5	3	0
Shale [a]	0	¾	0	¾
Coal	1	3¼	1	3½
Thickness of bed	5	6¾	5	4¼
Thickness of coal sampled	5	2	5	½

[a] Not included in sample.

Section A (sample 1341) was measured in room 15 off west entry 5 on the north side of the shaft.

Section B (sample 1342) was in room 16 off east entry 5 on the south side of the shaft.

Notes.—The coal that passed over a 2-inch perforated screen was sold for steam and domestic use; that which passed through was washed and separated into various commercial grades. The fifth, or finest grade, was not salable in 1904. The estimated capacity of the mine in 1904 was 1,800 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 449; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 59; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1057; Bull. 261, p. 93; Bureau of Mines Bull. 13, pp. 109, 272; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1437; Bull. 261, p. 153.

For chemical analyses see part I of this bulletin, p. 87; also U. S. Geol. Survey Prof. Paper 48, p. 209; Bull. 261, p. 37.

TROY. NO. 3 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 21) analyses Nos. 2770, 2771 (p. 88).

Mine.—No. 3; a shaft mine at Troy, on the St. Louis, Troy & Eastern Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey; Carboniferous age, Carbondale formation.

The thickness of the coal bed at this mine is 4 to 6 feet, averaging 5 feet. The bed has a "soapstone" roof, and a soft gray fire-clay floor, from which when dry the coal is easily shoveled. The impurities in the coal are thin layers of bone and shale. The mine shaft is 275 feet deep.

The following sections were measured and sampled by J. W. Groves and W. J. von Borries on January 12, 1906:

Sections of coal in No. 3 mine at Troy.

Section	A		B	
Laboratory No	2770		2771	
Roof, soapstone.	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	3	0	4
Coal	0	3	0	7
Shale [a]	..	..	0	¼
Coal	1	3	3	4
Shale [a]	0	1	..	..
Coal	1	10	..	..
Blue band [a]	0	¾	0	¾
Coal	1	2	1	4
Floor, fire clay				
Thickness of section	4	10¾	5	8
Thickness of coal sampled	4	6	5	3

[a] Not included in sample.

Section A (sample 2770) was measured in room 22 off east entry 5, south side, 1,500 feet southeast of the shaft.

Section B (sample 2771) was measured in room 26, off west entry 3, north side, 800 feet northwest of the shaft.

Note.—The coal from this mine, like that from many others in the district, is hard and firm.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 89; Bureau of Mines Bull. 23, pp. 61, 155; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 90; Bureau of Mines Bull. 13, pp. 116, 273; briquetting tests: U. S. Geol. Survey, Bull. 290, p. 91; washing tests: U. S. Geol. Survey, Bull. 332, p. 91; Bull. 336, p. 13; coking tests: U. S. Geol. Survey, Bull. 332, p. 91; Bull. 336, pp. 22, 28, 37.

For chemical analyses see part I of this bulletin, p. 88; also U. S. Geol. Survey Bull. 332, p. 89.

MARION COUNTY.

CENTRALIA. SOUTH MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No.15) analyses Nos. 1725, 1726 (p. 88).

Mine.—South; a shaft mine at Centralia, on the Illinois Central Railroad.

Coal bed.—The bed is the Herrin (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. The mine shaft is 557 feet deep to the top of the coal. The bed has a roof of hard sandy black shale. There are a few roof rolls, some of which reach nearly to the floor. The floor is a bluish shaly fire clay, which in places scales and makes some dirt.

Two sections of the bed in the mine were measured and sampled by J. W. Groves and J. S. Burrows on June 15, 1905, as shown below:

Sections of coal bed in South mine at Centralia.

Section	A		B	
Laboratory No	1725		1726	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	3½	0	8
Shale	0	¼	..	..
Mother coal	..	..	0	½
Coal	1	½	1	6
Shale, soft, sandy	0	¾	..	..
Mother coal	..	..	0	¾
Coal	1	8¼	1	8
Shale, local streak	0	⅛	..	..
Sulphur and shale [a]	..	..	0	½
Coal	0	9½	1	0
Shale, local streak	0	⅛	..	..
Blue band [a]	..	..	0	2
Coal	0	8	..	..
Blue band [a]	0	1½	..	..
Coal	1	5	0	1
Blue band [a]	..	..	0	3
Coal	..	..	0	4
Floor, bluish shaly fire clay.				
Thickness of section	7	1½	5	9¾
Thickness of coal sampled	7	0	5	4¼

[a] Not included in sample.

Section A (sample 1725) was measured in east entry 16, 3,000 feet southeast of the shaft.

Section B (sample 1726) was measured in south entry 14, 4,500 feet southwest of the shaft.

Notes.—The coal from this mine is bright, brittle, and hard, with a number of partings of paperlike shale and mother coal. In 1905, at the time of sampling, about 16 to 24 inches of the top coal, harder than the rest of the bed, was left for a roof in advancing rooms and was shot down and loaded when rooms were to be abandoned.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 83; Bureau of Mines Bull. 23, pp. 60, 153; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 84; Bureau of Mines Bull. 13, pp. 114, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 85; Bull. 336, p. 12.

For chemical analyses see part I of this bulletin, p. 88; also U. S. Geol. Survey Bull. 290, p. 82.

MONTGOMERY COUNTY.

COFFEEN. COFFEEN MINE.

Sample.—Bituminous coal; Illinois field; (Illinois Nos. 6, 6 B) analyses Nos. 1449, 1450, 1661 (p. 89).

Mine.—Coffeen; at Coffeen, on the Toledo, St. Louis & Western (Clover Leaf) Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey, locally known as the Pana. Carboniferous age, Carbondale formation. Thickness, fairly uniform, averaging 7½ feet; bed disturbed by rolls; no regular partings; roof, massive black shale; floor, fire clay; cover, over 500 feet.

The bed was measured and sampled at two points (A and B) by J. S. Burrows, on November 18, 1904, and at another point (C) by J. W. Groves, on May 25, 1905, as described below:

Sections of coal bed in Coffeen mine at Coffeen.

Section	A		B		C	
Laboratory No	1449		1450		1661	
Roof, secs. A and B, sandstone; sec. C, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Shale [a]	0	3	0	1	..	..
Coal	6	0	6	3	5	11
Shale and sulphur [a]	..	..	..	..	0	2
Blue limestone (?) [a]	0	2	0	3½	..	..
Coal	1	6	1	6	0	3
Shale [a]	..	..	..	..	0	1
Coal	..	..	..	..	1	3
Floor, fire clay.						
Thickness of bed	7	11	8	1½	7	8
Thickness of coal	7	6	7	9	7	5

[a] Not included in sample.

Section A (sample 1449) was measured at the face of room 21 off left entry 6.

Section B (sample 1450) was measured at the face of room 18 off right entry 4.

Section C (sample 1661) was measured in right entry 2, 1,500 feet northwest of the shaft.

Notes.—At the time this mine was sampled it had been in operation 16 years, and the operator estimated that enough coal remained to warrant mining for about 2 years more. The rated capacity of the mine was 450 tons per day. The larger part (70 per cent) of the product was used by the Toledo, St. Louis & Western Railroad, the remainder going to points in Illinois for factory and domestic use. Slack was sold for steam production.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 465; Bull. 260, p. 80; Bull. 290, p. 55; Bureau of Mines Bull. 23, pp. 59, 148; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 57; Bull. 336, p. 12; Bureau of Mines Bull. 13, pp. 109, 272.

For chemical analyses see part I of this bulletin, p. 89; also U. S. Geol. Survey Prof. Paper 48, p. 211; Bull. 261, p. 37; Bull. 290, p. 55.

ST. CLAIR COUNTY.

O'FALLON. NO. 1 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 1) analyses Nos. 1095, 1096 (p. 89).

Mine.—No. 1 (Nigger Hollow); Belleville district; a shaft mine 5½ miles southwest of O'Fallon, on a private railroad connecting the mine with East St. Louis.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey, termed locally the Belleville. Carboniferous age, Carbondale formation. Thickness, fairly uniform, averaging over 6 feet. At most of the large mines in the district, the cover is 100 to 200 feet. At the mine the shaft is 140 feet deep.

The bed was measured and sampled at two points by M. R. Campbell, on September 13, 1904, as described below:

Sections of coal bed in No. 1 mine, 5½ miles northwest of O'Fallon.

Section	A		B	
Laboratory No	1095		1096	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	5¼	0	11½
Sulphur knife edge	..	..	..	..
Coal	0	9½	0	4½
Sulphur knife edge	..	..	..	..
Coal	0	7½	0	5½
Shale[a]	0	½	..	..
Bone[a]	..	..	0	½
Coal	1	1½	0	5
Sulphur knife edge	..	..	..	..
Shale[a]	..	..	0	½
Coal	0	4	2	2
Shale[a]	0	1	..	..
Coal	..	..	0	3
Coal	1	10	..	..
Shale[a]	..	..	0	1
Coal	..	..	2	1
Thickness of bed	6	3¼	6	10½
Thickness of coal	6	1¾	6	8½

[a] Not included in sample.

Section A (sample 1095) was measured at a point 1,200 feet north of the shaft.

Section B (sample 1096) was measured at a point 1,200 feet south of the shaft.

Notes.—In 1904 the lump and nut coal was sold for locomotive fuel to various railroads entering East St. Louis, and the slack, that which passed through a 1-inch screen, found a ready market at electric power houses.

The output of the mine in 1904 was 1,500 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 425; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 59; briquetting tests: U. S. Geol. Survey Prof. Paper 48. p. 1437; Bull. 261, p. 153; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1332; Bull. 261, p. 122.

For chemical analyses see part I of this bulletin, p. 89; also U. S. Geol. Survey Prof. Paper 48, p. 206; Bull. 261, p. 36.

For geologic relations see U. S. Geol. Survey Bull. 438, pp. 25–30.

SHILOH. NO. 8 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 30) analyses Nos. 3910, 3912 (p. 89).

Mine.—No. 8; Belleville district; a shaft mine near Shiloh, on the Southern Railway.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Average thickness at this mine, 6 feet 8 inches. The mine shaft is 126 feet deep. The roof is gray shale and the floor is fire clay. Streaks and bands of shale and sulphur occur irregularly in the bed.

Two sections were measured by J. W. Groves and K. M. Way on October 8, 1906, as follows:

Sections of coal bed in No. 8 mine, near Shiloh.

Section	A		B	
Laboratory No	3910		3912	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	9	1	9
Sulphur	[a] 0	½	0	¹⁄₁₆
Coal	0	8	0	7
Shale	0	⅛	[a] 0	¾
Coal	1	4	0	6
Sulphur	[a] 0	¾	..	..
Mother coal	..	..	0	¼
Coal	1	4	0	7
Sulphur	[a] 0	½	[a] 0	¼
Coal	0	6	1	½
Sulphur	..	..	[a] 0	¼
Coal	..	..	0	3½
Blue band (shale)	..	..	[a] 0	1½
Coal	..	..	1	8
Floor, fire clay.				
Thickness of section	6	8⅞	6	8¹⁄₁₆
Thickness of coal sampled	6	7⅛	5	5⁵⁄₁₆

[a] Not included in sample.

Section A (sample 3910) was measured in the crosscut off west entry 1, south side, 900 feet southwest of the shaft.

Section B (sample 3912) was measured in east entry 3, 800 feet northeast of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 116; Bureau of Mines Bull. 23, pp. 61, 159; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 116; Bureau of Mines Bull. 13, pp. 123, 273; briquetting tests: U. S. Geol. Survey Bull. 332, p. 117; washing tests: U. S. Geol. Survey Bull. 332, p. 117; Bull. 336, pp. 14, 16.

For chemical analyses see part I of this bulletin, p. 89; also U. S. Geol. Survey Bull. 332, p. 115.

WORDEN. WORDEN MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 31) analyses Nos. 4250, 4251 (p. 89).

Mine.—Worden; Belleville district, at Worden, on the Wabash Railroad.

Coal bed.—Herrin coal (Belleville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Roof, shale; the top coal is left up in advancing and is taken down later; floor, fire clay.

The bed was measured and sampled at two points by K. M. Way on November 30, 1906, as described below:

Sections of coal bed in Worden mine at Worden.

Section	A		B	
Laboratory No	4250		4251	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	0	8	..	..
Coal	1	6½	1	9
Drift band [a]	0	1½	..	..
Sulphur	..	..	0	¼
Coal	0	11¼	1	2
Drift band [a]	..	..	0	½
Coal	..	..	0	4¾
Sulphur	0	⅛	0	¼
Coal	0	2¼	0	10¾
Sulphur [a]	0	¾	0	¾
Coal	1	4½	1	6¼
Sulphur [a]	0	¾	0	⅜
Coal	0	5½	0	5½
Blue band [a]	0	¾	0	1½
Coal	1	1	1	0
Floor, fire clay.				
Thickness of bed	6	6⅞	7	5⅞
Thickness of coal sampled	6	3⅛	7	2½

[a] Not included in sample.

Section A (sample 4250) was measured in south entry 4 on the west, 900 feet west and 850 feet south of the shaft.

Section B (sample 4251) was measured in north entry 2 on the west, 1,600 feet north and 300 feet west of the shaft.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 119; Bureau of Mines Bull. 23, pp. 61, 159; briquetting tests: U. S. Geol. Survey Bull. 332, p. 119.

For chemical analyses see part I of this bulletin, pp. 89, 90; also U. S. Geol. Survey Bull. 332, p. 119.

SALINE COUNTY.

Harrisburg. No. 9 Mine.

Sample.—Bituminous coal; Illinois field: (Illinois No. 34) analyses Nos. 4413, 4414, 7420, 7421 (p. 90).

Mine.—No. 9, a shaft mine at Harrisburg, on the Big Four System.

Coal bed.—No. 5 of the Illinois Geological Survey. Carboniferous age, Carbondale formation. Roof, excellent, of sandstone; floor, hard fire clay.

The bed was measured and sampled at two points by K. M. Way on January 9, 1907, as described below:

Sections of coal bed in No. 9 mine at Harrisburg.

Section	A		B	
Laboratory No.	4413		4414	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7¼	0	1¾
Sulphur	0	¼	0	¼
Coal	3	8	1	4
Mother coal	0	⅜	..	..
Sulphur	..	..	0	⅛
Coal	2	7	1	9
Sulphur[a]	..	..	0	1½
Blue band[a]	0	1¼	..	..
Coal	0	3	0	10½
Mother coal	..	..	0	¼
Coal	..	..	2	7½
Floor, hard fire clay.				
Thickness of bed	7	3⅛	7	10⅞
Thickness of coal sampled	7	1⅞	6	9⅜

[a] Not included in sample.

Section A (sample 4413) was measured 2,000 feet southwest of the shaft, in room 25, off west entry 4 on the south side.

Section B (sample 4414) was measured 1,000 feet north and 200 feet east of the shaft, in east entry 4 on the north side.

The bed was also measured and sampled at two points by G. S. Pope, as described below:

Sections of coal bed in No. 9 mine at Harrisburg.

Laboratory No.	7420		7421	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	2½	0	5
Sulphur[a]	0	½	0	¼
Coal	4	7¾	1	2¼
Sulphur[a]	..	..	0	½
Mother coal	0	¼	..	..
Coal	2	¾	4	7
Sulphur[a]	0	½	0	¼
Coal	0	3¾	0	10
Thickness of bed	7	4	7	1¼
Thickness of coal sampled	7	3	7	¼

[a] Not included in sample.

Sample 7420 was taken 3,000 feet southwest of shaft, off south entry 4, off west entry 4.

Sample 7421 was taken 1,200 feet northeast of shaft, in room 3, off east entry 6.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 123; Bureau of Mines Bull. 23, pp. 61, 159; washing tests: U. S. Geol. Survey Bull. 332, p. 123; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 124; Bull. 336, pp. 22, 28, 38.

For chemical analyses see part 1 of this bulletin, p. 90; also U. S. Geol. Survey Bull. 332, p. 123.

HARRISBURG. NO. 4 MINE.

Sample.—Bituminous coal; Illinois field; (Ann Arbor No. 12) analyses Nos. 7501, 7502 (p. 91).

Mine.—No. 4, a shaft mine ¼ mile south of Harrisburg (in the city limits), on the Big Four Railroad.

Coal bed.—No. 5. Carboniferous age, Carbondale formation. The bed is 5 to 6 feet thick, with strong shale roof and fire-clay floor.

Bed was measured and sampled by P. M. Riefkin on March 23, 1909, as shown below:

Sections of coal bed in No. 4 mine, ¼ mile south of Harrisburg.

Laboratory No.	7501		7502	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	8½	0	1
Sulphur	[a] 0	3/16	[a] 0	½
Coal	1	9¼	0	8
Sulphur	[a] 0	⅜	0	1/16
Coal	0	5⅛	0	10
Sulphur	[a] 0	6/16	0	⅛
Coal	0	5½	0	5 3/16
Sulphur	[a] 0	¼	..	..
Mother coal	..	..	0	⅛
Coal	0	5¾	0	1
Sulphur	[a] 0	¾	0	1/16
Coal	0	4	1	0
Sulphur	0	1/16	[a] 0	⅝
Coal	0	8	0	9
Sulphur	[a] 0	⅜	[a] 0	¾
Coal	0	5 6/16	1	2
Sulphur	[a] 0	5/16	..	..
Coal	0	8	..	..
Floor, fire clay.				
Thickness of bed	6	2 7/16	5	2 7/16
Thickness of coal sampled	6	3/16	5	1 10/16

[a] Not included in sample.

Sample 7501 was taken in south entry 8, off main east entry. It was wet when taken.

Sample 7502 was taken in north entry 2, off main east right entry. It was damp when taken.

Notes.—In 1909 the following sizes of coal were prepared: Below 1¼ inches, sold as screenings; 1¼ to 2 inches, steam size; 2 to 3 inches, domestic; over 3 inches, lump. The maximum capacity of mine was about 1,900 tons per day.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 34, 47.

For chemical analyses see part I of this bulletin, p. 91.

SANGAMON COUNTY.

AUBURN. AUBURN-ALTON MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 27) analyses Nos. 2897, 2898 (p. 91).

Mine.—Auburn-Alton; Springfield district; a shaft mine at Auburn, on the Chicago & Alton Railroad.

Coal bed.—Herrin coal (Bellville, No. 6) of the United States Geological Survey. Carboniferous age, Carbondale formation. Thickness, 6 feet to 7 feet 6 inches, at this mine, averaging 6 feet 8 inches; roof, laminated black shale which does not stand exposure to the air; coal is left for a roof; floor, gray fire clay.

Two sections were measured and sampled by J. W. Groves and W. J. von Borries on February 8, 1906, as shown below:

Sections of coal bed in Auburn-Alton mine at Auburn.

Section	A		B	
Laboratory No.	2897		2898	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Roof coal [a]	0	10	0	10
Coal	1	10	0	8
Shale [a]	0	½	..	..
Sulphur	..	..	0	⅛
Coal	0	7½	0	7½
Sulphur [a]	0	¾	..	..
Shale and sulphur [a]	..	..	0	¼
Coal	2	0	0	8
Sulphur	0	⅛	..	..
Shale [a]	..	..	0	¾
Coal	1	3	0	2
Sulphur [a]	..	..	0	⅛
Shale and sulphur [a]	0	½	..	..
Coal	0	10	0	6
Sulphur [a]	..	..	0	½
Coal	..	..	1	2
Sulphur [a]	..	..	0	½
Coal	..	..	0	7
Blue band [a]	..	..	0	2
Coal	..	..	2	0
Floor, fire clay.				
Thickness of section	7	6⅜	7	6¾
Thickness of coal sampled	6	6⅝	6	8⅝

[a] Not included in sample.

Section A (sample 2897) was measured in south entry 7, 2,000 feet southeast of the shaft.

Section B (sample 2898) was measured in the south entry 1, 1,400 feet south of the shaft.

Notes.—The coal is hard and the bed contains shale and "sulphur" in streaks and bands. The rated capacity of the mine in 1906 was 700 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 105; Bureau of Mines Bull. 23, pp. 61, 158; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 106; Bureau of Mines Bull. 113, pp. 122, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 106; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 106; Bull. 336, pp. 14, 22, 38.

For chemical analyses see part I of this bulletin, p. 91; also U. S. Geol. Survey Bull. 332, p. 105.

SPRINGFIELD. MINE NO. 2.

Sample.—Bituminous coal; Illinois field; (Illinois No. 14) analyses Nos. 1704, 1705 (p. 91).

Mine.—No. 2; Springfield district; a shaft mine on the east side of Springfield, on the Illinois Central Railroad.

Coal bed.—Springfield coal (No. 5) of the United States Geological Survey. Carboniferous age, Carbondale formation. The bed is nearly level, dipping about 1½° E. Shaft, 245 feet deep. The thickness of the coal varies from 5 to 7 feet, averaging 5 feet 11 inches. There is a hard black shale roof that contains some sulphur balls, and is generally good. The floor is a gray fire clay with a mixture of shale; in places it scales off, and pieces are shoveled up with the coal in loading mine cars.

The bed was measured and sampled at two points by J. W. Groves on June 10, 1905, as noted below.

Sections of coal bed in No. 2 mine, at Springfield.

Section	A		B	
Laboratory No	1704		1705	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	0	1	3
Mother coal	0	1/8	0	1/8
Coal	1	5	1	5
Shale	0	1/8	0	1/4
Coal	2	4	3	3
Floor, fire clay.				
Thickness of section	5	9 1/4	5	11 3/8
Thickness of coal sampled	5	9 1/4	5	11 3/8

Section A (sample 1704) was measured in room 30, off south entry 21, 1 mile southeast of the shaft.

Section B (sample 1705) was measured in entry 16, off stub entry 4, 4,000 feet northeast of the shaft.

Notes.—The coal from this mine, like that from others in this field, is tough and hard. The faces of the bed are not prominent; there are no regular partings, but some very thin streaks of shale. The "sulphur" showing is mostly in thin vertical streaks. In 1905, the tipple had 2½-inch bar screens, and revolving screens with 2-inch, 1¼-inch and ⅝-inch openings, making 4 sizes of coal. The rated capacity of the mine in 1905 was 900 to 1,000 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 80; Bureau of Mines Bull. 23, pp. 60, 153; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 81; Bureau of Mines Bull. 13, pp. 113, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 82; Bull. 336, p. 12.

For chemical analyses see Part I of this bulletin, p. 91; also U. S. Geol. Survey Bull. 290, p. 80.

WILLIAMSON COUNTY.

BUSH. BUSH NO. 1 MINE.

Sample.—Bituminous coal: Illinois field; (Illinois No. 12) analyses Nos. 1683, 1688 (p. 91).

Mine.—Bush No. 1; at Bush, on the St. Louis, Iron Mountain & Southern Railway.

Coal bed.—Herrin coal (No. 6). Carboniferous age, Carbondale formation. Nearly horizontal, and very even, the only disturbance being a few roof rolls. There are no clay veins. The roof is poor, a shale that does not stand exposure well, and from 1½ to 2 feet of coal is left for a roof in working. The floor is a soft gray fire clay, some of which may be shoveled up in loading mine cars.

Two sections were measured and sampled by J. W. Groves on June 1, 1905, as shown below:

Sections of coal bed in Bush No. 1 mine at Bush.

Section	A		B	
Laboratory No	1683		1688	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Coal	2	4	1	8
Sulphur [a]	0	2	..	..
Shale [a]	..	..	0	3/4
Coal	2	4	2	10
Shale and sulphur [a]	0	1	..	..
Shale [a]	..	..	0	1/2
Coal	1	4	0	3
Shale and sulphur [a]	..	..	0	1 1/2
Coal	..	..	1	6
Floor, fire clay.				
Thickness of section	6	3	6	5 3/4
Thickness of coal sampled	5	0	6	3

[a] Not included in sample.

Section A (sample 1683) was measured 1,000 feet northeast of the shaft in room 10, off east entry 1.

Section B (sample 1688) was measured 1,000 feet northwest of the shaft in north entry 1.

Notes.—The coal from this mine, like that from some others in this field, is tough, hard, and brittle, and withstands storage. The bed carries streaks of "sulphur" and gray shale. In this mine the partings are thin, of paper-like shale, and irregular. Lenticular sulphur balls occur in the coal. In 1905 the sizes of coal produced were 1, 2, 3, 4, and 5 with revolving screens of 3-inch, 1¾-inch, ¾-inch, and ¼-inch mesh. Coal passing through a 3-inch screen was washed.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 75; Bull 332, p. 83; Bureau of Mines Bull. 23, pp. 60, 150; briquetting tests: U. S. Geol. Survey Bull. 332, p. 84; washing tests: U. S. Geol. Survey Bull. 290, p. 76; Bull. 336, p. 12.

For chemical analyses see Part I of this bulletin, p. 91; also U. S. Geol. Survey Bull. 290, p. 74; Bull. 332, p. 83.

CARTERVILLE. DAW'S SHAFT.

Sample.—Bituminous coal; Illinois field; (Illinois No. 11) analysis No. 1634 (p. 91).

Mine.—Daw's; a shaft mine, near Carterville, on the Illinois Central Railroad.

Coal bed.—The coal worked at this mine is locally called the Big Muddy, correlated with the Herrin coal (No. 6) of the United States Geological Survey reports. It is of Carboniferous age, Carbondale formation.

The mine was measured and sampled by J. S. Burrows on May 18, 1905, as shown below:

Section of coal bed in Daw's shaft at Carterville.

Section	A	
Laboratory No.	1634	
	Ft.	*in.*
Coal	7	0
Shale[a]	0	2¼
Coal	1	10¾
Thickness of bed	9	1
Thickness of coal sampled	8	10¾

[a] Not included in sample.

The sample was taken from the face of the north entry, off the straight west heading.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 70; Bureau of Mines Bull. 23, pp. 59, 150; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 72; Bureau of Mines Bull. 13, pp. 112, 273; coking tests: U. S. Geol. Survey Bull. 290, p. 74; Bull. 336, pp. 21, 28, 37; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see Part I of this bulletin, p. 91; also U. S. Geol. Survey Bull. 290, p. 69.

CARTERVILLE. NO. 8 MINE.

Sample.—Bituminous coal; Illinois field; analyses Nos. 5238, 5215 (p. 92).

Mine.—No. 8, a shaft mine, 1½ miles north of Carterville, Williamson County, on the Illinois Central Railroad, in sec. 35, T. 8 S., R. 1 E.

Coal bed.—Herrin coal (No. 6); Carboniferous age, Carbondale formation. Thickness, about 7 feet 9 inches; roof, slate; floor, fire clay.

The bed was measured and sampled at two points by G. S. Pope, on June 28, 1907, as shown below:

Sections of coal bed in No. 8 mine, 1½ miles north of Carterville.

Laboratory No.	5238		5215	
	Ft.	*in.*	*Ft.*	*in.*
Roof, slate.				
Coal	0	8⅜	1	2½
Bone	[a] 0	⅞	0	1/16
Coal	0	10½	1	5½
Mother coal	0	½		⅛
Coal	0	6	0	4
Mother coal	0	1/16	0	1
Coal	3	1¼	2	1
Shale	[a] 0	1	0	⅛
Coal	1	11¼	1	0
Slate	..	..	[a] 0	1½
Coal	..	..	0	5½
Shale	..	..	[a] 0	⅜
Coal	..	..	1	2
Thickness of bed	7	3 13/16	7	11 11/16
Thickness of coal sampled	7	1 15/16	7	9 13/16

[a] Not included in sample.

Sample 5238 was taken 500 feet north and 2,900 feet west of the shaft, in room 5, off north entry 12, on the west entry.

Sample 5215 was taken 2,209 feet north and 2,200 west of the shaft, in room 13, off west entry 2, off north entry 4. The samples were dry when taken.

Notes.—In 1907 all coal was washed except egg and 6-inch lump. Room-and-pillar method of mining; no machines used; drilling done by hand. The daily output of the mine in June, 1907, was 1,600 tons.

For chemical analyses of this coal, see Part I of this bulletin, p. 92.

HERRIN. NO. 7 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 16) analyses Nos. 1731, 1732, and analyses Nos. 3629, 3632, 3636 (pp. 92, 93).

Mine.—No. 7; Big Muddy district; at Herrin, on the Illinois Central Railroad.

Coal bed.—Herrin coal (No. 6) of the United States Geological Survey; Carboniferous age, Carbondale formation. At this mine the bed as a whole is horizontal with local hollows in the floor and rolls in the roof. The bed is from 6 feet to 9 feet 6 inches thick, with an average thickness of 8 feet 9 inches, and has a number of partings of mother coal and paper-like shale. The roof is a massive gray somewhat sandy shale cut by vertical joints; falls in thick layers on exposure. Local rolls cut out some of the coal in places. The floor is generally good, a hard fire clay, averaging 18 inches thick. In places it is scaled off with the coal by shoveling.

The bed was measured and sampled at two widely separated points by J. W. Groves on June 16, 1905. The sections were as follows:

Sections of coal bed in No. 7 mine at Herrin.

Section	A		B	
Laboratory No.	1731		1732	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal [a]	1	7	..	..
Coal	0	7	0	6
Sulphur [a]	..	..	0	¼
Mother coal	0	¼	..	..
Coal	0	7	0	8
Shale, regular parting	..	..	0	⅛
Mother coal	0	⅛	..	..
Coal	0	11	1	3
Mother coal	..	..	0	⅛
Shale and mother coal	0	¼	..	..
Coal	1	8	1	3
Sulphur	..	..	0	⅛
Shale	0	⅛	..	..
Coal	..	..	1	6
Mother coal	0	⅛	0	⅛
Coal	1	4	1	7
Blue band [a]	0	1	0	2
Coal	2	0	2	0
Floor, fire clay.				
Thickness of section	8	9⅞	8	11¾
Thickness of coal sampled	7	1⅞	8	9½

[a] Not included in sample.

Section A, sample 1731, was measured at a point 2,300 feet southwest of the shaft, in room 17, off south entry 6, west side.

Section B, sample 1732, was measured 2,400 foot northeast of the shaft, room 14, off north entry 5, east side.

The bed was also measured and sampled at three points by K. M. Way. Sample 3629 was taken at a point 2,400 feet west of shaft. The sample included a 7-foot cut. It was taken from north straight entry. Sample 3632 was taken 2,250 feet northwest of shaft; 83-inch cut. Sample 3636 was taken west of shaft, 1,800 feet north; 7-foot cut.

Notes.—The coal from this mine, like that from many others in this field, is brittle and bright, the top coal being the hardest. Room-and-pillar system of mining used in 1905, and coal shot from solid. In general about 7 feet of the lower part of the bed was mined, leaving 16 to 24 inches for a roof. The top coal was shot down and loaded when the rooms were ready to be abandoned. The rated capacity of the mine in 1905 was 1,000 tons per day. The unwashed sizes made were: Lump, over 6-inch screen; egg, through 6-inch and over 3-inch screen. The washed sizes were 4, 3, and 2, through ¾-inch, 1-inch, and 1¾-inch holes, respectively. The refuse from the washer went to the dump.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 86; Bureau of Mines Bull. 23, pp. 60, 153; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 86; Bureau of Mines Bull. 13, pp. 114, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 87; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 88; Bull. 336, pp. 21, 23, 37; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, pp. 92, 93; also U. S. Geol. Survey Bull. 290, p. 85; Bull. 332, p. 107.

MARION. NO. 3 MINE.

Sample.—Bituminous coal; Illinois field; (Illinois No. 3) analyses Nos. 1170, 1171 (p. 93).

Mine.—No. 3; a shaft mine, at Marion on the Chicago & Eastern Illinois Railroad.

Coal bed.—Herrin coal (No. 6) of the United States Geological Survey, known locally as the Carterville. Carboniferous age. Carbondale formation. Thickness, at mine, fairly uniform; dip, nearly flat; cover, at this mine, about 100 feet.

The bed was measured and sampled at two points by J. W. Groves on October 3, 1904, as shown below:

Sections of coal bed in No. 3 mine at Marion.

Section	A		B	
Laboratory No	1170		1171	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	4	5	0
Shale [a]	0	1	..	..
Sulphur [a]	..	..	0	2
Coal	4	5	..	..
Shale [a]	0	1	0	1½
Coal	2	5	1	10
Thickness of bed	7	4	7	1½
Thickness of coal mined	7	2	6	10

[a] Not included in sample.

Section A (sample 1170) was measured in southwest entry 3.

Section B (sample 1171) was measured in north entry 1 on the east side of the mine.

Notes.—The output of the mine in 1904 was about 1,500 tons a day. About half of the product was sold for domestic use, the other half for factory and railroad supply. The coal was nearly all shipped through Chicago to the Northwest.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 441; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 59; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1042; Bull. 261, p. 91; Bureau of Mines Bull. 13, pp. 109, 272; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1466; Bull. 261, p. 66; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1334; Bull. 261, p. 123.

For chemical analyses see part 1 of this bulletin, p. 93; also U. S. Geol. Survey Prof. Paper 48, p. 208; Bull. 261, p. 36.

INDIANA.

CLAY COUNTY.

BRAZIL. NO. 4 MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 20) analyses Nos. 3536, 3537 (p. 93).

Mine.—No. 4; a shaft mine, at Brazil, and 1 mile southwest of Perth, on the Chicago & Eastern Illinois Railroad.

Coal bed.—Locally known as the "Brazil Block bottom bed." Carboniferous age, Pottsville formation. It lies nearly flat, and is reached by a shaft 148 feet deep. The thickness is fairly uniform, averaging 3 feet 7 inches. The roof is a black shale. The floor is shale; in places there are 2 feet of "blackjack" below the coal, and in places 2 feet of shale.

The bed was measured and sampled at two widely separated points by K. M. Way, F. B. Tough, and J. W. Groves, as shown below:

Sections of coal bed in No. 4 mine at Brazil.

Section	A		B	
Laboratory No	3536		3537	
Roof, gray shale:	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	4	0	6
Soft coal	0	1	..	..
Mother coal	..	..	0	0¾
Coal	..	..	3	1
Floor: sec. A, blackjack; sec. B, shale:				
Thickness of bed	3	5	3	7¾
Thickness of coal sampled	3	5	3	7¾

Section A (sample 3536) was measured in the main south entry, 800 feet southeast of the shaft.

Section B (sample 3537) was measured in west entry 2, north side, 600 feet northwest of the shaft.

For results of tests of this coal, see mention of specific tests as follows: briquetting tests: U. S. Geol. Survey Bull. 332, p. 146; washing tests: U. S. Geol. Survey Bull. 332, p. 145; Bull. 336, p. 14.

For chemical analyses see part I of this bulletin, p. 93; also U. S. Geol. Survey Bull. 332, p. 145.

DAVIESS COUNTY.

MONTGOMERY. NO. 3 MINE.

Sample.—Bituminous coal; block coal field; analyses Nos. 3510, 3511 (p. 93).

Mine.—No. 3; 1 mile west of Montgomery.

The coal bed was measured and sampled in 1906 by J. W. Groves and J. B. Tough.

Sample 3510 was taken from room 4, off north entry 12, 2,000 feet north of bottom of shaft.

Sample 3511 was taken from west entry 2 on the south side, 900 feet southwest of bottom of shaft.

For chemical analyses of this coal see part I of this bulletin, p. 93.

GREEN COUNTY.

LINTON. BLACK CREEK MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 15) analyses Nos. 3473, 3474 (p. 93).

Mine.—Black Creek; a shaft mine 2 miles west of Linton, on the Southern Indiana Railroad.

Coal bed.—No. 4 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. The thickness at this mine is fairly uniform, averaging 4 feet 4 inches of clean coal. The bed lies nearly flat, dipping southwest about 5 feet in a mile, and is reached by a shaft 90 feet deep. The roof is a gray shale; about 18 inches of it falls readily, or is taken down. The floor is a firm gray shale, about 3 inches thick, underlain with sandstone. The bed carries no regular partings, but has some local streaks of shale and mother coal. The coal is hard, brittle, of a dull-black color, and shows a little brittle sulphur.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves on July 30, 1906, as shown below:

Sections of coal bed in Black Creek mine, 2 miles northwest of Linton.

Section	A		B	
Laboratory No.	3473		3474	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	0	1	3
Mother coal	0	¼	..	..
Shale	..	..	0	⅛
Coal	2	7	1	6
Mother coal	..	..	0	½
Coal	..	..	1	4
Floor, gray shale.				
Thickness of coal bed	4	7¼	4	1⅝
Thickness of coal sampled	4	7¼	4	1⅝

Section A (sample 3473) was measured in room 33, off southeast entry 6, 2,000 feet southeast of the shaft.

Section B (sample 3474) was measured in room 26, off northeast entry 6, 1,900 feet northeast of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 135; Bureau of Mines Bull. 23, pp. 62, 163; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 136; Bureau of Mines Bull 13, pp. 132, 273.

For chemical analyses see part I of this bulletin, p. 93; also U. S. Geol. Survey Bull. 332, p. 135.

LINTON. WHITE RABBIT MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 16) analyses Nos. 3475, 3476 (p. 94).

Mine.—White Rabbit; 4 miles west of Linton, on the Vandalia Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. It is over 7 feet thick in places. Carboniferous age, Carbondale formation. The bed lies nearly flat, and is worked by a shaft 95 feet deep. The roof is a hard shale, containing many sulphur balls. The floor is blackjack, or coal high in ash with a few paper-like streaks of shale. The bed has sulphur, "bony" coal, and shale partings. These partings are not regular in thickness.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves and F. B. Tough on July 31, 1906, as shown below:

Sections of coal bed in White Rabbit mine, 4 miles west of Linton.

Section	A		B	
Laboratory No.	3475		3476	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	1	4
Bone coal [a]	0	2½	..	..
Sulphur	..	..	..	⅛
Coal	..	5½	1	0
Sulphur	0	1/16	..	..
Mother coal	..	..	0	¼
Coal	0	7	1	0
Sulphur	0	⅛	0	1/16
Coal	1	7	1	11
Bone coal and sulphur [a]	0	1½	..	..
Shale [a]	..	..	0	½
Coal	1	4	1	8
Sulphur [a]	..	½	..	..
Coal [a]	0	2	..	..
Shale [a]	0	2	..	..
Coal	1	0	..	..
Floor, blackjack.				
Thickness of coal bed	7	4 3/16	6	11 15/16
Thickness of coal sampled	6	7 11/16	6	11 7/16

[a] Not included in sample.

Section A (sample 3475) was measured in the main west entry, 650 feet west of the shaft.

Section B (sample 3476) was measured in room 7 of southeast entry 2, 500 feet southeast of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 137; Bureau of Mines Bull. 23, pp. 62, 163; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 137; Bureau of Mines Bull. 13, pp. 132, 273.

For chemical analyses see part I of this bulletin, p. 94; also U. S. Geol. Survey Bull. 332, p. 137.

KNOX COUNTY.

BICKNELL. LINN MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 17) analyses Nos. 3516, 3517 (p. 94).

Mine.—Linn; a shaft mine at Bicknell, on the Vandalia Railroad.

Coal bed.—No. 6 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. The bed lies nearly flat, and at this mine is worked by a shaft 190 feet deep. Its average thickness is 5½ feet. The roof is a hard black shale, containing many concretions of pyrite. The floor is a hard sandy shale, underlain with sandstone. The bed carries streaks of sulphur and mother coal.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves and F. B. Tough on August 6, 1906, as shown below:

Sections of coal bed in Linn mine at Bicknell.

Section	A		B	
Laboratory No.	3516		3517	
Roof, hard black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	6	3	10
Sulphur	0	⅛	..	..
Streaks of sulphur and coal	..	..	0	¼
Coal	0	8	0	8
Mother coal	0	½	0	¾
Coal	1	11	1	4
Mother coal	0	¼	.	..
Coal	1	2½	..	..
Sulphur [a]	0	1½	..	..
Coal	0	8½	..	..
Floor, sandy shale.				
Thickness of coal bed	5	2⅜	5	11
Thickness of coal sampled	5	⅞	5	11

[a] Not included in sample.

Section A (sample 3516) was measured in room 5, third north entry, 500 feet northeast of the shaft.

Section B (sample 3517) was measured in room 4, of third north entry on the west, 250 feet northwest of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 139; Bureau of Mines Bull. 23, pp. 63, 163; coking tests: U. S. Geol. Survey Bull. 332, p. 139; Bull. 336, pp. 23, 29, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74; Bull. 332, p. 139.

For chemical analyses see part I of this bulletin, p. 94; also U. S. Geol. Survey Bull. 332, p. 138.

PARKE COUNTY.

DIAMOND. NO. 9 MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 19) analyses Nos. 3534, 3535 (p. 94).

Mine.—No. 9; a shaft mine, three-fourths mile northwest of Diamond, on the Chicago & Eastern Illinois Railroad.

Coal bed.—"Brazil Block upper bed." Carboniferous age, Upper Pottsville formation. Thickness at this mine averages 4 feet 4 inches, ranging from 4 feet to 5 feet 4 inches. It lies nearly flat, and is worked by a shaft 121 feet deep. The roof is poor, a massive gray shale, overlain with sandstone. The sandstone in places cuts out the shale and forms a good roof for the coal. The floor is a white fire clay.

Two sections were measured and sampled at widely separated points in the mine by K. M. Way, F. B. Tough, and J. W. Groves on August 10, 1906, as shown below:

Sections of coal bed in No. 9 mine, three-fourths mile northwest of Diamond.

Section	A		B	
Laboratory No	3535		3534	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	4
Splint coal	0	2	..	..
Splint	..	..	0	1½
Coal	2	1	0	1
Splint coal	0	1½	..	⅛
Sulphur	..	..		
Coal	0	8	1	10
Sulphur [a]	..	..	0	½
Splint	..	..	0	2
Coal	..	..	1	2
Floor, white fire clay.				
Thickness of coal bed	4	½	4	9⅛
Thickness of coal sampled	4	½	4	8⅝

[a] Not included in sample.

Section A (sample 3535) was measured in room 3, off north entry 2, on the east side, 500 feet east of the shaft.

Section B (sample 3534) was measured in room 1, north entry 2, 1,200 feet southwest of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 144; Bureau of Mines Bull. 23, pp. 63, 164; briquetting tests: U. S. Geol. Survey Bull. 332, p. 144.

For chemical analyses see part I of this bulletin, p. 94; also U. S. Geol. Survey Bull. 332, p. 143.

ROSEDALE. ROSEDALE MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 10) analyses Nos. 1853, 1854 (pp. 94, 95).

Mine.—Rosedale; a shaft mine near Rosedale, on the Vandalia Railroad.

Coal bed.—No. 3 of the Indiana Geological Survey. Carboniferous age, Pottsville (?) formation. It lies nearly flat, and is worked by a shaft 750 feet deep. Its thickness is about 6 feet. The roof is of sandstone. The floor is "blackjack," or black shale, 3 to 4 inches thick, with sandstone below.

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries and J. W. Groves on July 19, 1905, as shown below:

Sections of coal bed in Rosedale Mine, near Rosedale.

Section	A		B	
Laboratory No	1853		1854	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	1	1	0
Mother coal	0	1/16	..	..
Shale	..	..	0	1/16
Coal	1	9	0	9
Blackjack [a]	0	3½	..	..
Sulphur	..	..	0	⅛
Coal	0	6	0	4
Shale and sulphur [a]	0	1½	..	..
Sulphur [a]	..	..	0	½
Coal	1	0	1	2
Sulphur [a]	0	1	..	..
Shale	..	..	0	1/16
Coal	0	9	0	4
Blackjack [a]	..	..	0	2½
Coal	..	..	0	8
Sulphur	..	..	0	1/16
Coal	..	..	1	9
Floor: Section A, black shale and sandstone; section B, blackjack and sandstone.				
Thickness of coal bed	5	7 1/16	6	3 5/16
Thickness of coal sampled	5	1 1/16	5	5/16

[a] Not included in sample.

Section A (sample 1853) was measured in south entry 16, 3,000 feet southeast of the shaft.

Section B (sample 1854) was measured in north entry 18, 3,000 feet northeast of the shaft.

Notes.—The rated capacity of this mine in 1905 was 1,000 tons per day. The sizes shipped were lump, run-of-mine, nut, and slack.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 115; Bureau of Mines Bull. 23, pp. 62, 162; washing tests: U. S. Geol. Survey Bull. 290, p. 116; Bull. 336, p. 12.

For chemical analyses see part I of this bulletin, p. 94; also U. S. Geol. Survey Bull. 290, p. 115.

PIKE COUNTY.

AYRSHIRE. AYRSHIRE NO. 4 MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 18) analyses Nos. 3525, 3526 (p. 95).

Mine.—Ayrshire No. 4; a drift mine near Ayrshire, 1 mile southwest of Winslow, on the Southern Railway.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Average thickness, 4 feet 9 inches; roof, gray shale; floor, gray fire clay.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves and F. B. Tough on August 8, 1906, as shown below:

Sections of coal bed in Ayrshire No. 4 mine at Ayrshire.

Section	A		B	
Laboratory No.	3525		3526	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11	0	10
Sulphur [a]	0	1/8	0	1 1/2
Coal	0	4	0	5
Hard coal	0	2	..	..
Sulphur	..	..	0	1/16
Coal	1	6	0	7
Mother coal	0	1	0	1/2
Coal	1	9	0	11
Mother coal	..	..	0	1/4
Coal	..	..	1	11
Floor, gray fire clay.				
Thickness of coal bed	4	9 1/8	4	10 5/16
Thickness of coal sampled	4	9	4	8 13/16

[a] Not included in sample.

Section A (sample 3525) was measured in west entry 10, 3,400 feet south of the slope opening.

Section B (sample 3526) was measured in room 11 off south entry 6, 3,400 feet south of the slope opening.

Notes.—The sizes of steaming coal produced in 1905 were lump, nut, and slack. The slack was washed.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 141; Bureau of Mines Bull. 23, pp. 62, 163; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 142; Bureau of Mines Bull. 13, pp. 133, 273; coking tests: U. S. Geol. Survey Bull. 332, p. 142; Bull. 336, pp. 23, 29, 39.

For chemical analyses see part I of this bulletin, p. 95; also U. S. Geol. Survey Bull. 332, p. 141.

HARTWELL. HARTWELL MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 12) analyses Nos. 2701 2702 (p. 95).

Mine.—Hartwell; a drift mine at Hartwell, on the Southern Railway.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform, barely averaging 5 feet; roof, slate; floor, fire clay. At the bottom of the bed is a thin, rather persistent band of shale and "sulphur."

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries on December 20, 1905, as shown below:

Sections of coal bed in Hartwell mine at Hartwell.

Section	A		B	
Laboratory No	2701		2702	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	5	1	..
Sulphur	[a] 0	½	..	..
Mother coal	..	..	..	¼
Coal	0	7	2	0
Sulphur	[a] 0	½	0	⅛
Coal	0	10	1	10
Sulphur	[a] 0	⅛	..	..
Coal	1	10	..	..
Floor, fire clay.				
Thickness of coal bed	4	9⅛	4	10⅜
Thickness of coal sampled	4	8	4	10⅜

[a] Not included in sample.

Section A (sample 2701) was measured in room 7, off west entry 4, 1,200 feet northwest of the opening.

Section B (sample 2702) was measured in room 3, off west entry 1, 900 feet northwest of the opening.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 129; Bureau of Mines Bull. 23, pp. 62, 162; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 129; Bureau of Mines Bull. 13, pp. 129, 273; washing tests: U. S. Geol. Survey Bull. 332, p. 130; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 130; Bull. 336, pp. 22, 23, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74; Bull. 332, p. 130.

For chemical analyses see part I of this bulletin, p. 95; also U. S. Geol. Survey Bull. 332, p. 128.

LITTLES. LITTLE'S MINE.

Sample.—Bituminous coal; block coal field; (Indiana No. 7) analyses Nos. 1824, 1825 (p. 95).

Mine.—Little's; a shaft mine at Littles on the Evansville & Terre Haute Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, at this mine, uniform, averaging about 6 feet; bed lies nearly flat, and is worked by a shaft 80 feet deep; roof, massive black shale, made uneven by pots or ridges, which, however, do not fall, or give trouble in mining; floor, black shale with coal 20 inches to 2 feet thick; beneath it is light-gray fire clay. The coal has no regular partings, but contains streaks of pyrite and shale.

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries and J. W. Groves on July 11, 1905, as shown below:

Sections of coal bed in Little's mine at Littles.

Section	A		B	
Laboratory No	1824		1825	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	5	3	0	11
Sulphur [a]	0	¾	0	½
Coal	0	9	4	2
Sulphur [a]	..	..	0	1
Coal	..	..	1	0
Floor, black shale, with coal.				
Thickness of coal bed	6	¾	6	2½
Thickness of coal sampled	6	0	6	1

[a] Not included in sample.

Section A (sample 1824) was measured in south entry 8, 2,000 feet southeast of the shaft.

Section B (sample 1825) was measured in the main east entry, 2,600 feet east of the shaft.

Note.—The coal from this mine, like that from other mines working the No. 5 bed in this field, is tough and firm.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 106; Bureau of Mines Bull. 23, pp. 62, 160; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 107; Bureau of Mines Bull. 13, pp. 127, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 108; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 108; Bull. 336, pp. 22, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 95; also U. S. Geol. Survey Bull. 290, p. 106.

SULLIVAN COUNTY.

DUGGER. NO. 4 MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 11) analyses Nos. 1883, 1884 (p. 96).

Mine.—No. 4; a shaft mine at Dugger, on the Vandalia Railroad.

Coal bed.—No. 4 of the Indiana Geological Survey. Carboniferous age, Allegheny formation. Thickness nearly uniform, being about 5 feet 2 inches. Bed lies nearly flat, and is worked by a shaft 270 feet deep; roof, gray shale; floor, bluish shale.

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries and J. W. Groves on July 24, 1905, as shown below:

Sections of coal bed in No. 4 mine at Dugger.

Section	A		B	
Laboratory No.	1883		1884	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	8	1	9
Blackjack[a]	0	2	0	¼
Coal	0	4	1	2
Sulphur	0	½	..	..
Blackjack[a]	..	..	0	1
Coal	1	11	2	2
Floor, sec. A, blue shale; sec. B, black shale.				
Thickness of coal bed	5	1½	5	2¼
Thickness of coal sampled	4	11½	5	1

[a] Not included in sample.

Section A (sample 1883) was measured in room 8, east entry 1, 500 feet northeast of the shaft.

Section B (sample 1884) was measured in room 1, west entry 1, 600 feet northwest of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 117; Bureau of Mines Bull. 23, pp. 62, 162; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 118; Bureau of Mines Bull. 13, pp. 129, 273; coking tests: U. S. Geol. Survey Bull. 290, p. 119; Bull. 336, pp. 22, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 96; also U. S. Geol. Survey Bull. 290, p. 117.

HYMERA. NO. 33 MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 5) analyses Nos. 1773, 1774 (p. 96).

Mine.—No. 33; a shaft mine at Hymera, on the Evansville & Terre Haute Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, variable; roof, black shale, with about 4 or 5 inches of "draw slate;" floor, fire clay, with a streak of hard sulphurous shale. In places this hard shale is 1½ inches thick. The bed carries no regular partings, but has occasional streaks of "sulphur." There are no "clay veins."

The bed was measured and sampled at two widely separated points in the mine by J. S. Burrows, W. J. von Borries, and J. W. Groves on June 29, 1905, as shown below:

Sections of coal bed in No. 33 mine at Hymera.

Section	A		B	
Laboratory No.	1773		1774	
Roof: sec. A, black shale with 4 inches of draw slate; sec. B, slate.	*Ft.*	*in.*	*Ft.*	*in.*
"Draw slate" [a]	0	2¼	..	..
Coal	5	2	6	11
Floor: sec. A, hard sulphurous shale and fire clay; sec. B, fire clay with a little sulphur.				
Thickness of bed	5	4¼	6	11
Thickness of coal sampled	5	2	6	11

[a] Not included in sample.

Section A (sample 1773) was measured in room 16, east entry 2, 1,600 feet southwest of the shaft.

Section B (sample 1774) was measured in east entry 2 on the north side, 1,200 feet northeast of the shaft.

Notes.—The coal at this mine resembles that from other mines working in the same district. It is hard, rather brittle, and has a glossy luster.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 100; Bureau of Mines Bull. 23, pp. 61, 160; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 101; Bureau of Mines Bull. 13, pp. 124, 273; briquetting tests: U. S. Geol. Survey Bull. 332, p. 126; coking tests, U. S. Geol. Survey Bull. 290, p. 102; Bull. 336, pp. 22, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 96; also U. S. Geol. Survey Bull. 290, p. 100; Bull. 336, p. 126.

HYMERA. NO. 34 MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 6) analyses Nos. 1772, 1776 (p. 96).

Mine.—No. 34; a shaft mine near Hymera, on the Evansville & Terre Haute Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform, ranging from 5 feet 10 inches to 6 feet 4 inches. The bed is cut in places by "clay veins" and carries partings of shale and sulphur. The roof is a bed of shale 4 to 6 inches thick, which is pulled down in mining. The floor is a thin bed of black shale 1 to 1½ inches thick, below which is fire clay 3 feet thick.

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries and J. W. Groves on June 29, 1905, as shown below:

Sections of coal bed in No. 34 mine at Hymera.

Section	A		B	
Laboratory No	1772		1776	
Roof, sec. A, "draw slate;" sec. B, "draw slate" and gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	..	..
Shale	..	..	[a] 0	6
Mother coal	[a] 0	⅛	..	..
Coal	0	11	[a] 0	2
Mother coal	..	..	[a] 0	⅛
Shale	[a] 0	2	..	..
Coal	0	8	1	4
Sulphur and shale	..	..	0	3/16
Shale	[a] 0	1	..	..
Coal	2	5	0	10
Shale	[a] 0	1	[a] 0	1½
Coal	0	8	0	3
Sulphur	..	..	[a] 0	½
Coal	..	..	1	8
Sulphur	..	..	[a] 0	2
Coal	..	..	1	4
Floor: sec. A, shale and fire clay; sec. B, black shale and fire clay.				
Thickness of coal bed	6	8⅛	6	5 5/16
Thickness of coal sampled	6	4	5	5 3/16

[a] Not included in sample.

Section A (sample 1772) was measured in room 2, off second east entry south, 300 feet southeast of the shaft.

Section B (sample 1776) was measured in the main north entry, 425 feet north of the shaft.

Notes.—The coal from this mine, like that from other mines working in this district, is hard and brittle, and has a glossy luster. The rated capacity of the mine in 1905 was 90 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 103; Bureau of Mines Bull. 23, pp. 61–62, 160; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 104; Bureau of Mines Bull. 13, pp. 126, 273; briquetting tests: U. S. Geol. Survey Bull. 332, p. 127; washing tests: U. S. Geol. Survey Bull. 290, p. 105; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 105; Bull. 336, pp. 22, 29, 38.

For chemical analyses see part I of this bulletin, p. 96; also U. S. Geol. Survey Bull. 290, p. 103; Bull. 332, p. 127.

MILDRED. MILDRED MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 1) analyses Nos. 1410, 1412 (p. 96).

Mine.—Mildred, at Mildred, on the Evansville & Terre Haute Railroad.

Coal bed.—Known as No. 6. Carboniferous age, Carbondale formation. This coal underlies Sullivan County as a seemingly continuous bed, averaging about 6 feet in thickness. From its outcrop east of Sullivan County it dips toward the west, being at a depth of from 130 to 140 feet in the vicinity of Mildred.

Two samples were obtained in the mine by J. S. Burrows on November 10, 1904, as shown below:

Sections of coal bed in Mildred mine at Mildred.

Section	A		B	
Laboratory No	1412		1410	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	5	2	2
Shale [a]	0	½	0	½
Coal	0	6	0	6½
Shale [a]	0	1	0	¾
Coal	2	2	2	2
Bony coal [a]	1	0	1	¾
Total thickness of bed	6	2½	6	½
Total thickness of coal	5	1½	4	10¼

[a] Not included in sample.

Section A was measured at the face of room 4, off the southwest entry, and section B was measured some distance east of section A at the face of room 5, off the southeast entry.

Notes.—This mine was opened in 1903. It was expected to have a capacity of 600 tons per day. The output in 1904 was sold for steam and domestic purposes.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 473; Bull. 261, p. 80; Bureau of Mines Bull. 23, p. 61; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1068; Bull. 261, p. 94; Bureau of Mines Bull. 13, pp. 123, 273; briquetting tests; U. S. Geol. Survey Prof. Paper 48, p. 1438; Bull. 261, p. 154; Bull. 332, p. 125; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1463; Bull. 261, p. 63; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1336; Bull. 261, p. 123.

For chemical analyses see part I of this bulletin, p. 96; also U. S. Geol. Survey Prof. Paper 48, p. 212; Bull. 261, p. 38; Bull. 332, p. 125.

Star City. No. 29 Mine.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 4) analyses Nos. 1775, 1807 (p. 97).

Mine.—No. 29; a shaft mine at Star City, on the Evansville & Terre Haute Railroad.

Coal bed.—No. 6 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. It contains many partings of shale and sulphur. Its thickness is fairly uniform, being between 5 feet 8 inches and 5 feet 4 inches. The roof is a gray shale, none of which is taken down in mining. The floor is a gray shale. The bed has a few faults or clay veins. There are partings of shale and thin partings of sulphur.

Two sections in the mine were measured and sampled by J. S. Burrows on June 28, 1905, as shown below:

Sections of coal bed in No. 29 mine at Star City.

Section	A		B	
Laboratory No.	1775		1807	
Roof, sec. A, gray shale; sec. B, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10	1	6
Shale, black [a]	0	1	..	..
Coal, mother	..	..	0	$\frac{1}{16}$
Coal	0	5	0	6
Pyrites	0	¼	..	..
Shale [a]	..	..	0	½
Coal	0	2	..	4
Shale, black [a]	0	1¼	..	..
Shale [a]	..	..	0	1
Coal	2	3	0	1
Shale [a]	0	¾	0	1
Coal	1	1	2	0
Sulphur [a]	..	..	0	1½
Coal	..	..	0	6
Floor, sec. A, gray shale; sec. B, black shale.				
Thickness of coal bed	6	¼	6	3$\frac{1}{16}$
Thickness of coal sampled	5	9¼	5	11$\frac{1}{16}$

[a] Not included in sample.

Section A (sample 1775) was measured in room 1, off east entry 13, 3,900 feet north of the shaft.

Section B (sample 1807) was measured in entry 8, south side, 4,000 feet southeast of the shaft.

Notes.—The coal produced at this mine, like that from others working the same bed in the vicinity, is rather hard and brittle, and has a bright glossy luster. The bed has no face and butt joints. In mining, the bottom coal is in places left for a floor and in places is mined.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 98; Bureau of Mines Bull. 23, pp. 61, 159, 160;

washing tests: U. S. Geol. Survey Bull. 290, p. 99; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 99; Bull. 336, pp. 22, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 97; also U. S. Geol. Survey Bull. 290, p. 97.

VIGO COUNTY.

MACKSVILLE. RED BIRD MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 9) analyses Nos. 1848 and 1849 (p. 97).

Mine.—Red Bird; a shaft mine at Macksville, on the Vandalia Railroad.

Coal bed.—No. 7 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, about 6 feet. It lies nearly flat, and is worked by a shaft 97 feet deep. The roof is bone coal, about 2 feet thick. Above this is black shale. The floor is a hard black clay. The coal is worked to an average height of 5 feet 8 inches. It carries no regular partings, but contains a great deal of pyrite in streaks and concretions.

The bed was measured and sampled at two widely separated points in the mine by W. J. von Borries on July 17, 1905, as shown below:

Sections of coal bed in Red Bird mine at Macksville.

Section	A		B	
Laboratory No	1848		1849	
Roof, sec. A, black hard clay; sec. B, blue hard clay.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4	1	0
Mother coal	0	⅛	..	⅛
Coal	0	10	1	5
Mother coal	0	⅛	..	..
Sulphur and mother coal	..	..	0	¼
Coal	0	7	1	0
Sulphur and mother coal	0	¼	..	..
Shale, sulphur, and coal	..	..	0	½
Coal	3	4	1	3
Coal and sulphur streaks	0	2	..	..
Coal	0	6	..	..
Floor, sec. A, black hard clay; sec. B, blue hard clay.				
Thickness of bed	5	9½	4	8⅞
Thickness of coal sampled	5	9½	4	8⅞

Section A (sample 1848) was measured in room 18, north entry 5, 1,900 feet north of the shaft.

Section B (sample 1849) was measured in east entry 4, off north entry 6, 2,000 feet north and 10 degrees east of the shaft.

Notes.—The rated capacity of this mine in 1905 was about 400 tons, two-fifths of the output being lump, one-fifth being nut, and two-fifths being slack. The pyrite separated from the coal was sold to manufacturers of sulphuric acid, about 100 tons per month being shipped.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 112; Bureau of Mines Bull. 23, pp. 62, 161–162; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 113; Bureau of Mines Bull. 13, pp. 127, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 114; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 114; Bull. 336, pp. 22, 29, 38; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 97; also U. S. Geol. Survey Bull. 290, p. 112.

SEELYVILLE. No. 65 MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 14) analyses Nos. 3491, 3492 (p. 97).

Mine.—No. 65; a shaft mine 1½ miles east of Seelyville, on the Vandalia Railroad.

Coal bed.—No. 3 of the Indiana Geological Survey. Carboniferous age, Pottsville formation. Its thickness is fairly uniform, being 7 to 7½ feet. It lies nearly flat, and is worked by a shaft 90 feet deep. The roof of the bed is a shale, which falls upon exposure to the air; in entries, 18 inches of coal is left up for roof. The floor is a hard gray shale. The bed contains two regular bands of shale, which have a top and bottom layer of shale and a few inches of coal between. In places the bed carries other bands of pyrite, shale, and bone coal.

The bed was measured and sampled at two widely separated points in the mine by F. B. Tough on July 26, 1906, as shown below:

Sections of coal bed in No. 65 mine, 1½ miles east of Seelyville.

Section	A		B	
Laboratory No.	3491		3492	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	11	0	2
Shale [a]	0	1½	0	..
Sulphur	..	..	..	1½
Coal	[a] 0	2	1	11
Shale [a]	0	1½	0	¾
Coal	0	6	0	2
Mother coal	0	¾	..	..
Shale [a]	..	..	0	1
Coal	1	2	0	11
Shale [a]	0	2	..	..
Sulphur	..	..	..	$\frac{1}{16}$
Coal	0	3	0	8
Shale [a]	0	2½	0	2½
Coal	0	11	0	5
Bone coal [a]	0	4	..	..
Shale [a]	..	..	0	1½
Coal	0	10	2	8
Bone coal [a]	0	5	..	..
Coal	0	3	..	..
Floor, hard gray shale.				
Thickness of coal bed	7	5¼	7	$6\frac{5}{16}$
Thickness of coal sampled	5	7¾	6	$2\frac{1}{16}$

[a] Not included in sample.

Section A (sample 3491) was measured in room 18, off right entry 2, 2,400 feet northeast of the shaft.

Section B (sample 3492) was measured in room 13, off left entry 3, 900 feet southeast of the shaft.

Notes.—The coal from this mine, like that from other mines working the No. 3 bed in the vicinity, is hard and brittle. The rated capacity of the mine in 1906 was 1,000 tons per day. The sizes produced were run-of-mine, lump, nut, and slack.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 134; Bureau of Mines Bull. 23, pp. 62, 163; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 134; Bureau of Mines Bull. 13, pp. 131, 273.

For chemical analyses see part 1 of this bulletin, p. 97; also U. S. Geol. Survey Bull. 332, p. 133.

TERRE HAUTE. DEEP VEIN MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 8) analyses Nos. 1828, 1829 (p. 97).

Mine.—Deep Vein; 2 miles west of Terre Haute, on the Vandalia Railroad.

Coal bed.—No. 4 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform, averaging a little over 4 feet. The bed lies nearly flat, and is worked by a shaft 170 feet deep. The roof is very hard shale, and the floor is fire clay.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves on July 13, 1905.

Section A (sample No. 1828) comprised 4 feet 1 inch of clean coal and was taken 700 feet southeast of shaft, room 8, off south entry 4, east side; section B (sample No. 1829) comprised 4 feet 3 inches of coal and was taken 800 feet northwest of shaft, west entry 6, north side. Both sections were taken across the full thickness of the bed.

Note.—The rated capacity of this mine in 1905 was 400 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 109; Bureau of Mines Bull. 23, pp. 62, 161; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 110; Bureau of Mines Bull. 13, pp. 127, 273; washing tests: U. S. Geol. Survey Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 111.

For chemical analyses see part I of this bulletin, p. 97; also U. S. Geol. Survey Bull. 290, p. 109.

TERRE HAUTE. HOME MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 13) analyses Nos. 3467, 3468 (p. 98).

Mine.—Home; 3 miles west of Terre Haute, on the Vandalia Railroad.

Coal bed.—Said to be No. 6 of the Indiana Survey. Carboniferous age, Carbondale formation. At this mine it lies nearly flat, and is worked by a shaft 65 feet deep. The roof is a layer of "bone" coal about 20 inches thick, overlain with shale. The floor is a light-gray fire clay. The bed carries a number of sulphur partings of pyrites and irregularly distributed bands of bone coal.

The bed was measured and sampled at two widely separated points in the mine by J. W. Groves on July 25, 1906, as shown below:

Sections of coal bed in the Home mine, 3 miles west of Terre Haute.

Section	A		B	
Laboratory No	3467		3468	
Roof, bone coal.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	4	0	6
Coal	0	8	1	1
Sulphur [a]	0	1	..	..
Mother coal	..	..	0	½
Coal	1	7	2	5
Shale [a]	0	½	..	..
Mother coal	..	..	0	½
Coal	0	11	0	7
Sulphur [a]	0	¾	..	..
Bone and sulphur [a]	..	..	0	1
Coal	0	7	0	9
Sulphur [a]	0	2	0	1
Coal	0	5	0	7
Floor, fire clay.				
Thickness of coal bed	4	10¼	6	2
Thickness of coal sampled	4	2	5	6

[a] Not included in sample.

Section A (sample 3467) was measured in room 4, off east entry 2, 3.000 feet south of the shaft.

Section B (sample 3468) was measured in room 9, off south entry 5, 3,000 feet southwest of the shaft.

Note.—The pyrite in this mine, as at some other mines in this field, is collected for shipment to sulphuric-acid factories.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 132; Bureau of Mines Bull. 23, pp. 62, 163; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 132; Bureau of Mines Bull. 13, pp. 129, 273.

For chemical analyses see part I of this bulletin, p. 98; also U. S. Geol. Survey Bull. 332, p. 131.

WARRICK COUNTY.

BOONVILLE. BIG FOUR MINE.

Sample.—Bituminous coal; bituminous coal field; analyses Nos. 1424, 1427 (p. 98).

Mine.—Big Four; a shaft mine at Boonville, on the Southern Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale series. Thickness, fairly uniform, averaging 6 feet near Boonville; roof, black sheety shale, overlain with limestone. The bed has no persistent parting and is essentially the same as in the Electric mine (Indiana No. 2).

This bed was measured and sampled at two points by J. S. Burrows on November 12, 1904. There is no record of the sections.

Sample 1424 was taken from a point 35 yards from the main working face in the west entry, and sample 1427 was taken from room No. 9, off the main west entry.

For chemical analyses of this coal see part I of this bulletin, p. 98.

For mention of these samples see U. S. Geol. Survey Prof. Paper 48, p. 66.

BOONVILLE. ELECTRIC MINE.

Sample.—Bituminous coal; bituminous coal field (Indiana No. 2); analyses Nos. 1425, 1426 (p. 98).

Mine.—Electric; a shaft mine at Boonville, on the Southern Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness, fairly uniform, averaging in the vicinity of Boonville about 6 feet; dip, nearly flat; roof, sheety shale, overlain with limestone. The total cover is about 50 feet. The bed has no persistent partings.

The bed was measured and sampled at two points by J. S. Burrows on November 12, 1904. Section A (sample 1425) included 7 feet of clean coal. Section B (sample 1426) included 7 feet 6 inches of clean coal. Both sections were made the full thickness of the bed.

Section A was measured in room 4, off the north entry, and section B was measured at the face of room 8, off the south entry.

Notes.—In 1905 most of the coal mined was used for railroad and domestic purposes. The rated capacity of the mine was 650 tons per day. Some of the product was shipped to the large cities of the Middle West.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 489; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 61; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1079; Bull. 261, p. 96; Bureau of Mines Bull. 13, pp. 123, 273; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1439; Bull. 261, p. 154.

For chemical analyses see part I of this bulletin, p. 98; also U. S. Geol. Survey Prof. Paper 48, p. 213; Bull. 261, p. 38.

BOONVILLE. NO. 3 MINE.

Sample.—Bituminous coal; bituminous coal field; (Indiana No. 3) analyses Nos. 1759, 1760 (p. 98).

Mine.—No. 3; a shaft mine near Boonville, on the Evansville & Terre Haute Railroad.

Coal bed.—No. 5 of the Indiana Geological Survey. Carboniferous age, Carbondale formation. Thickness at this mine, fairly uniform, averaging a little over 7 feet. The bed lies nearly flat and is worked by a shaft 45 feet deep. The roof is of black shale, with "pots" or bell-shaped masses that are liable to fall in mining. The floor is black shale and fire clay.

Two sections in the mine were measured and sampled by J. W. Groves on June 27, 1905, as shown below.

Sections of coal bed in No. 3 mine, near Boonville.

Section	A		B	
Laboratory No.	1759		1760	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	0	8
Sulphur	0	$\frac{1}{4}$	..	..
Sulphur (pyrites)	..	..	0	$\frac{1}{4}$
Coal	1	10	0	10$\frac{1}{2}$
Mother coal	Trace.		..	..
Bone	..	..	0	$\frac{1}{16}$
Coal	1	1$\frac{1}{2}$	0	5$\frac{1}{2}$
Sulphur	0	$\frac{1}{8}$	..	..
Mother coal	..	..	0	$\frac{1}{16}$
Coal	0	10	2	4
Sulphur	0	$\frac{1}{16}$	..	..
Pyrites	..	..	0	$\frac{1}{4}$
Coal	2	3	0	9$\frac{1}{2}$
Pyrites	..	..	0	$\frac{1}{4}$
Coal	..	..	2	4
Floor, shale.				
Thickness of coal bed	7	$\frac{15}{16}$	7	6$\frac{3}{8}$

Section A (sample 1759) was measured in room 14, northeast entry, 1,500 feet northeast of the shaft.

Section B (sample 1760) was measured in room 14, off north entry 2 off west entry, 600 feet northwest of the shaft.

Notes.—The average output of this mine in 1905 was 500 tons per day, 90 per cent of which was shipped as run of mine. Very little lump coal was shipped. The slack produced averaged about 10 per cent of the total output.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull 290, p. 95; Bureau of Mines Bull 23, pp. 61, 159; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 96; Bureau of Mines Bull. 13, pp. 124, 273; washing tests: U. S. Geol. Survey Bull. 290, p. 96; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 97; Bull. 336, pp. 22, 29, 38.

For chemical analyses see part I of this bulletin, p. 98; also U. S. Geol. Survey Bull. 290, p. 94.

INDIAN TERRITORY.

Places and mines formerly included in Indian Territory are here listed under Oklahoma.

IOWA.

APPANOOSE COUNTY.

CENTERVILLE. NO. 3 MINE.

Sample.—Bituminous coal; Iowa field; (Iowa No. 4) analyses Nos. 1323, 1324 (p. 99).

Mine.—No. 3; Appanoose district; at Centerville, on the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Iowa Central, and the Chicago, Milwaukee & St. Paul railroads.

Coal bed.—The coal bed which is being mined covers nearly all of Appanoose County and parts of adjoining counties of Iowa and Missouri. In the reports of the Iowa Geological Survey this bed is called the lower Mystic coal. Carboniferous age, Henryetta formation. At Centerville it is found at a depth of 125 feet, rising gradually to the north and east. At the mine from which the sample was obtained the coal is reached at a depth of 110 feet by a shaft.

Two sections of the bed were measured and sampled by J. W. Groves on October 28, 1904, as shown below:

Sections of coal bed in No. 3 mine, at Centerville.

Section	A	B
Laboratory No	1324	1323
	Ft. in.	*Ft. in.*
Coal	1 9	1 7
Fire clay[a]	0 4	0 1
Coal	0 11	1 3
Thickness of bed	3 0	2 11
Thickness of coal sampled	2 8	2 10

[a] Not included in sample.

Section A (sample 1324) was measured in room 1, off east entry 6.

Section B (sample 1323) was measured in room 1, off east entry 6, off main south entry.

Notes.—In 1904 about half the daily output (900 tons) of the three companies working in the Appanoose district was sold for steam production and half for domestic use. Of the coal sold for steam production, railroads took 75 per cent and factories 25 per cent.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 553; Bull. 261, p. 81; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1443; Bull. 261, p. 158; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1470; Bull. 261, p. 69; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1342; Bull. 261, p. 125.

For chemical analyses see part I of this bulletin, p. 99; also U. S. Geol. Survey Prof. Paper 48, p. 224; Bull. 261, p. 43.

LUCAS COUNTY.

Chariton. Inland No. 1 Mine.

Sample.—Bituminous coal; Iowa field; (Iowa No. 5) analyses Nos. 1332, 1333 (p. 99).

Mine.—Inland No. 1; in secs. 4, 5, 8, and 9, T. 72 N., R. 21 W., about 5 miles northeast of Chariton.

Coal bed.—Two extensive coal beds have been recognized in Lucas County, one near the surface and the other about 250 feet below. Both are of Carboniferous age, Des Moines group. This mine is working the lower bed by a shaft 250 feet deep. The bed is irregular, being disturbed by "horsebacks." The thick coal lies in local basins or swamps, and does not extend far. The roof is black shale. On the floor is about 3 inches of shale, overlying sandy clay.

Four sections, two of which were sampled, were measured by J. W. Groves in 1904. Section A (sample 1333), measured in room 33, off north entry 2, showed 7 feet 7 inches of clean coal, and section B (sample 1332), measured in room 8, off east entry 1 on the south side of the mine, showed 7 feet of clean coal. In the other two sections the coal bed was, respectively, 7 feet 4 inches and 7 feet 9 inches thick.

Note.—When this mine was inspected in 1904 it had no railroad connections, but gave promise of developing into a large mine.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 569; Bull. 261, p. 81; washing tests: U. S. Geol. Survey Prof. Paper 48. p. 1470; Bull. 261, p. 70; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1343; Bull. 261. p. 125.

For chemical analyses see part I of this bulletin, p. 99; also U. S. Geol. Survey Prof. Paper 48, p. 225; Bull. 261, p. 43.

MARION COUNTY.

HAMILTON. NO. 5 MINE.

Sample.—Bituminous coal; Iowa field; (Iowa No. 2) analyses Nos. 1289 and 1291 (p. 99).

Mine.—No. 5; a shaft mine near Hamilton, in Liberty Township, on the Wabash Railroad.

Coal bed.—There are at least six well-defined coal beds in Marion County. The bed worked in No. 5 mine is known locally as the Big Vein. It is of Carboniferous age, Des Moines group formation. It lies nearly horizontal, and is worked at a depth of 45 feet. The bed has streaks and bands of shale and sulphur, and contains many large sulphur balls, most of which were picked out in loading the coal.

Two sections of the bed were measured and sampled by J. W. Groves in 1904.

The sections are as follows:

Sections of coal bed in No. 5 mine, near Hamilton.

Section	A.		B.	
Laboratory No.	1291		1289	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	11	1	3
Sulphur and shale [a]	0	1	..	..
Sulphur [a]	..	..	0	2
Coal	1	3	3	11
Sulphur and shale [a]	0	6	..	..
Coal	2	6	..	..
Thickness of bed	7	3	5	4
Thickness of coal	6	8	5	2

[a] Not included in sample.

Section A was measured in west entry 5 on the south side of the mine, and section B was measured in west entry 3 on the south side of the mine.

Notes.—In 1904 the coal was used almost exclusively as railroad fuel. The slack, which constituted a small per cent of the total output, was used for steam production. The rated capacity of the mine was 1,100 tons per day of run-of-mine coal, and the daily output at the time the mine was visited was 825 tons.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 539; Bull. 261, p. 81; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1122; Bureau of Mines Bull. 13, pp. 135, 274; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1469; Bull. 261, p. 69; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1341; Bull. 261, p. 124.

For chemical analyses see part I of this bulletin, p. 99; also U. S. Geol. Survey Prof. Paper 48, p. 222; Bull. 261, p. 42.

MONROE COUNTY.

AVERY. SMOKY HOLLOW NO. 6 MINE.

Sample.—Bituminous coal; Iowa field; (special samples) analyses Nos. 1288, 1290 (p. 100).

Mine.—Smoky Hollow No. 6; at Avery.

Coal bed.—Known as the Third Seam. The coal is of Carboniferous age, in the Cherokee shale.

The bed was measured and sampled by J. W. Groves on October 20, 1904. The samples each represented a cut from roof to floor.

For chemical analyses of this coal see part I of this bulletin, p. 100; also U. S. Geol. Survey Prof. Paper 48, pp. 81 and 270.

POLK COUNTY.

Altoona. No. 4 Mine.

Sample.—Bituminous coal; Iowa field; (Iowa No. 3) analyses Nos. 1312, 1313 (p. 100).

Mine.—No. 4; near Altoona, on the Chicago, Rock Island & Pacific Railway.

Coal bed.—In Polk County three workable beds of coal are recognized. They are commonly called the "First," "Second," and "Third" beds. Associated with them are other beds that are not of workable thickness. Mine No. 4 is on the Third bed, which lies almost flat, under about 200 feet of cover. It is of Carboniferous age, in the Cherokee shale.

Two sections of the bed were measured and sampled by J. W. Groves in 1904. Section A (sample 1313), measured in north entry 9, showed 3 feet 10 inches of clean coal. Section B (sample 1312), measured in the main west entry, showed 4 feet 7 inches of clean coal. Both sections were the full thickness of the bed.

Notes.—In 1904 most of the output went to towns along the Chicago, Rock Island & Pacific Railway for domestic use; part was used for engine supply and part for factories. The rated capacity of the mine in 1904 was 600 tons a day, and the daily shipments were about 400 tons.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 545; Bull. 261, p. 81; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1469; Bull. 261, p. 69; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1341; Bull. 261, p. 125.

For chemical analyses see part I of this bulletin, p. 100; also U. S. Geol. Survey Prof. Paper 48, p. 223; Bull. 261. p. 42.

WAPELLO COUNTY.

Laddsdale. Anchor No. 2 Mine.

Sample.—Bituminous coal; Iowa field; (Iowa No. 1) analyses Nos. 1270, 1271 (p. 100).

Mine.—Anchor No. 2; a shaft mine at Laddsdale, on the Chicago, Rock Island & Pacific Railway.

Coal bed.—This mine works two beds designated locally as the Middle bed and the Third bed. They are of Carboniferous age, in the Cherokee shale. The thickness varies decidedly. The dip varies only slightly. The Middle bed at the shaft is 58 feet below surface and the Third bed 70 feet below the surface.

The two beds were measured at two points and sampled at one point each by J. W. Groves in October, 1904. In the Middle bed section A (sample 1271) showed 2 feet 11 inches of clean coal and section C 3 feet 10 inches.

In the Third bed section B (sample 1270) showed 2 feet 3 inches of clean coal, and section D showed 4 feet 5 inches.

Notes.—The output of the mine in October, 1904, was only about 60 tons daily, but the mine was expected to produce 300 tons. Most of the product was taken by railroads for engine use. The slack sold readily as a steam coal.

For results of tests of this coal, see mention of specific tests as follows—steam tests: U. S. Geol. Survey Prof. Paper 48, p. 529; Bull. 261, p. 81; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1469; Bull. 261, p. 68; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1340; Bull. 261, p. 124.

For chemical analyses see part I of this bulletin, p. 100; also U. S. Geol. Survey Prof. Paper 48, p. 221; Bull. 261, p. 41.

KANSAS.

CHEROKEE COUNTY.

SCAMMON. NO. 9 MINE.

Sample.—Bituminous coal; Kansas field; (Kansas No. 3) analyses Nos. 1036, 1037 (p. 101).

Mine.—No. 9; ¼ mile west of the station at Scammon, on the St. Louis & San Francisco Railroad.

Coal bed.—The Weir-Pittsburg lower bed is worked in the No. 9 mine. This bed is of Carboniferous age, Cherokee shale. It dips gently north, and lies from 80 to 100 feet below the surface.

Two sections of the bed were measured and sampled by M. R. Campbell and J. S. Burrows in 1904.

Section A (sample 1037) was measured at a working face 500 feet north of the shaft.

Section B (sample 1036) was measured at a working face 600 feet south of the shaft.

At both faces the sections showed 4 feet of clean coal.

Notes.—The coal contains lenses of pyrite that are readily separated in mining. In 1904 a large part of the output was screened coal. The rated output of the mine was 250 to 300 tons per day. The lump coal was sold in near-by towns and the slack went to packing houses in Kansas City.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 609; Bull. 261, p. 81; Bureau of Mines Bull. 23, pp. 64, 168; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1345; Bull. 261, p. 125.

For chemical analyses see part I of this bulletin, p. 101; also U. S. Geol. Survey Prof. Paper 48, p. 228; Bull. 261, p. 45.

WEST MINERAL. NO. 11 MINE.

Sample.—Bituminous coal; Kansas field; (Kansas No. 5) analyses Nos. 1411, 1413 (p. 101).

Mine.—No. 11; at West Mineral, on the Missouri, Kansas & Texas Railway.

Coal bed.—One of the Weir-Pittsburg coals is worked at a depth of 174 feet. This coal is of Carboniferous age, Cherokee shale. The bed is of uniform thickness and is free from partings, but "horsebacks" are numerous, rendering some of it worthless.

Two sections of the bed were measured and sampled by M. R. Campbell in November, 1904. Section A (sample 1411) was measured in the main east entry, at a point 900 feet from the foot of the shaft, where the bed showed 3 feet 5¾ inches of clean coal, and section B (sample 1413) was measured in the main west entry, about 540 feet from the foot of the shaft, where the clean coal was 3 feet 5 inches thick.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 633; Bull. 261, p. 81; Bureau of Mines Bull. 23, pp. 64, 168; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 432; Bull. 290, p. 120; Bureau of Mines Bull. 13, pp. 135, 274.

For chemical analyses see part I of this bulletin, p. 101; also U. S. Geol. Survey Prof. Paper 48, p. 230; Bull. 261, p. 45; Bull. 290, p. 119.

CRAWFORD COUNTY.

FLEMING. NO. 10 MINE.

Sample.—Bituminous coal; Kansas field; (Kansas No. 1) analyses Nos. 1018, 1020 (p. 101).

Mine.—No. 10; at Fleming, 1 mile east of Cherokee, on the Missouri Pacific Railway.

Coal bed.—The only important coals near Fleming are in the Weir-Pittsburg group (Carboniferous age, Cherokee shale), which consists of two beds, known as the upper and the lower. Their outcrops extend northeast and southwest past Stippleville, Scammon, Weir City, Pittsburg, and other cities. The coal mined at Pittsburg is the lower Weir-Pittsburg. It is thicker and worked more than the other beds. At No. 10 mine the coal is reached by a shaft 102 feet deep. The roof of the bed is a soft shale, 2 feet of which are brushed to get height in the entries.

At two widely separated points in the mine, sections were measured and sampled by J. W. Groves and J. S. Burrows in 1904. Section A (sample 1018) showed 3 feet 5½ inches of clean coal, and section B (sample 1020) showed 3 feet 3 inches of clean coal. The samples were taken from widely separated points in the mine.

Notes.—In 1904 the output was used mostly for steam production, the Missouri Pacific Railway taking a large part for engine coal. The output in 1904 was about 350 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 585; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 64; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1344; Bull. 261, p. 125.

For chemical analyses see part I of this bulletin, p. 101; also U. S. Geol. Survey Prof. Paper 48, p. 226; Bull 261, p. 44.

FRONTENAC. No. 11 MINE.

Sample.—Bituminous coal; Kansas field; (Denver No. 23) analyses Nos. 660–D, 661–D (p. 101).

Mine.—No. 11; a shaft mine in sec. 29, T. 29 S., R. 25 W., 3 miles north of Frontenac, on the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—Cherokee, or Weir-Pittsburg. Carboniferous age, Cherokee shale. Thickness, fairly uniform; roof, shale; floor, fire clay.

The bed was measured and sampled at two points by K. M. Way on October 3, 1908, as shown below:

Sections of coal bed in No. 11 mine, 3 miles north of Frontenac.

Section	A		B	
Laboratory No.	660–D		661–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	0	5½
Shale and sandstone [a]	0	½	..	..
Sulphur	..	..	0	¼
Coal	0	2	0	2¼
Mother coal	0	⅛	0	¼
Coal	0	9¼	0	10¼
Bone coal	0	¼	..	..
Mother coal	..	..	0	¼
Coal	0	5¾	..	..
Mother coal and shale	0	¼	..	..
Coal	0	9¼	1	6
Floor, fire clay.				
Thickness of bed	2	11⅜	3	¾
Thickness of coal sampled	2	10⅞	3	¾

[a] Not included in sample.

Section A (sample 660–D) was measured 4,000 feet west of the opening, in the main west entry.

Section B (sample 661–D) was measured 3,000 feet south of the opening, in south entry 1, off main west entry.

Note.—The rated capacity of the mine in 1908 was 50 tons per day.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 50.

For chemical analyses see part I of this bulletin, p. 101; also Bureau of Mines Bull. 5, p. 33.

YALE. NO. 11 MINE.

Sample.—Bituminous coal; Kansas field; (Kansas No. 2) analyses Nos. 1017, 1019 (p. 102).

Mine.—No. 11; at Yale, on the Missouri Pacific Railway.

Coal bed.—The coal worked is the lower Weir-Pittsburg Carboniferous age, Cherokee shale. This coal is about as thick as at Fleming (Kansas No. 1), but contains two rather persistent bands of sulphurous shale, dividing the bed into three benches of almost equal thickness. The bed lies nearly horizontal and at this mine is reached by a shaft 96 feet deep. The coal is friable, and the percentage of slack is large. Most of the output is used for steam production and finds a ready market. The production in 1908 was about 550 tons daily.

The following sections were measured in 1904 at points some distance apart in the mine by J. S. Burrows:

Sections of coal bed in No. 11 mine at Yale.

Section	A		B	
Laboratory No	1017		1019	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	4	0	6
Sulphur	0	¼	[a] 0	½
Coal	1	5	1	2
Sulphur	0	¼	[a] 0	½
Coal	1	3	1	4
Thickness of bed	3	½	3	1
Thickness of coal sampled	3	½	3	0

[a] Not included in sample.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 593; Bull. 261, p. 81; Bull. 332, p. 153; Bureau of Mines Bull. 23, pp. 64, 168; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1443; Bull. 261, p. 159; Bull. 332, p. 155; washing tests: U. S. Geol. Survey Bull. 332, p. 154; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1345; Bull. 261, p. 125.

For chemical analyses see part I of this bulletin, p. 102; also U. S. Geol. Survey Prof. Paper 48, p. 227; Bull. 261, p. 44; Bull. 332, p. 153.

LINN COUNTY.

JEWETT. NO. 1 MINE.

Sample.—Bituminous coal; Kansas field; (Kansas No. 6) analyses Nos. 2790, 2791 (p. 102).

Mine.—No. 1; a shaft mine, at Jewett, on the Missouri Pacific Railroad.

Coal bed.—Weir-Pittsburg. Carboniferous age, Cherokee shale. Thickness at this mine, fairly uniform, averaging 34 inches; dip, nearly flat; roof, heavy shale, about 22 feet thick, overlain with limestone, sandstone, and shale; over roads the shale is taken down to a height of 6 feet. The floor is a gray fire clay. The bed contains streaks of sulphur and near the bottom a band of mixed shale and coal. The cover is about 85 feet thick.

The bed was measured and sampled at two points by W. J. von Borries, in 1905, as described below:

Sections of coal bed in No. 1 mine at Jewett.

Section	A		B	
Laboratory No	2790		2791	
Roof: sec. A, shale; sec. B, soapstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	5	1	0
Shale and coal [a]	0	2	..	..
Niggerhead	..	..	0	¼
Coal	0	3	1	2
Floor, fire clay.				
Thickness of bed	2	10	2	2¼
Thickness of coal sampled	2	8	2	2¼

[a] Not included in sample.

Section A (sample 2790) was measured in east entry 6, 2,000 feet northeast of the shaft.

Section B (sample 2791) was measured in west entry 3, 1,200 feet northwest of the shaft.

Notes.—The coal from this mine, like that from many others in this field, is hard and tough. The approximate output of the mine in 1900 was 200 tons a day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 156; Bureau of Mines Bull. 23, pp. 64, 168; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 157; Bureau of Mines Bull. 13, pp. 135, 274; washing tests: U. S. Geol. Survey Bull. 332, p. 157; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 158; Bull. 336, pp. 23, 24, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74.

For chemical analyses see part I of this bulletin, p. 102; also U. S. Geol. Survey Bull. 332, p. 156.

KENTUCKY.

BELL COUNTY.

STRAIGHT CREEK. STRAIGHT CREEK NO. 2 MINE.

Sample.—Bituminous coal; eastern Kentucky field; (Kentucky Nos. 1, 1B, 1C) analyses Nos. 1321, 1322, 2350, 2351 (p. 103).

Mine.—Straight Creek No. 2; a drift mine at Straight Creek, on the Louisville & Nashville Railroad.

Coal bed.—The bed mined is locally known as the Straight Creek. It has not been definitely correlated with any of the beds of Tennessee and eastern Kentucky, but may be the same as the Jellico coal, worked farther south. It is of Carboniferous age, Pottsville group. The bed lies nearly horizontal. The roof and the floor are hard, gray, laminated, sandy shale.

Two sections were measured and sampled by J. S. Burrows, on October 25, 1904, and two by J. W. Groves, October 11, 1905. They are shown below:

Sections of coal bed in Straight Creek No. 2 mine, at Straight Creek.

Section	A		B		C		D	
Laboratory No	1321		1322		2350		2351	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, shaly [a]	0	4½	..	..	..	..	..	..
Clayey shale	..	..	..	..	..	..	..	..
Coal, clean	3	1	3	2½	..	..	..	..
Coal	..	..	..	..	0	3	3	6
Sulphur	..	..	..	..	0	⅛	..	..
Coal	..	..	..	..	2	5	..	..
Mother coal	..	..	..	..	0	⅛	..	..
Coal	..	..	..	..	0	4	..	..
Mother coal	..	..	..	..	0	⅛	..	..
Coal	..	..	..	..	0	4½	..	..
Floor: Sects. A, B, and D, shale; sect. C, shale and rock.								
Thickness of bed	3	5½	3	2½	3	4⅞	3	6
Thickness of coal sampled	3	1	3	2½	3	4⅞	3	6

[a] Not included in sample.

Section A (sample 1321) was measured at the face of the main entry.

Section B (sample 1322) was measured in room 76, off the main entry.

Section C (sample 2350) was measured 3,000 feet northeast of the drift mouth, in room 99, off the main entry.

Section D (sample 2351) was measured in room 48, off north butt entry 4, 3,600 feet from the mine opening.

Notes.—In 1904 the coal was sold for domestic use, coke making, manufacturing, and for engine coal on railroads. The principal distributing points were Louisville, Ky., Indianapolis, Ind., and Chicago, Ill. The mine had an output of 600 tons a day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 641; Bull. 261, p. 81; Bull. 290, p. 121; Bureau of Mines Bull. 23, pp. 64, 168; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 122; Bureau of Mines Bull. 13, pp. 135, 274; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1443; Bull. 261, p. 159; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1347; Bull. 261, p. 126; Bull. 290, p. 123; Bull. 336, pp. 23, 29, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 103; U. S. Geol. Survey Prof. Paper 48, p. 231; Bull. 261, p. 46; Bull. 290, p. 121.

HARLAN COUNTY.

BIG BLACK MOUNTAIN. PROSPECT PIT.

Sample.—Bituminous coal; eastern Kentucky field; (Kentucky No. 5) analyses Nos. 2270, 2271, 2272 (p. 103).

Mine.—Prospect pit, 1 mile south of Gilliam's rock house on Big Black Mountain, 15 miles from the Louisville & Nashville Railroad.

Coal bed.—Locally known as the High Splint. Carboniferous age, Pottsville (?) group. Thickness, fairly uniform; dip, nearly flat; roof, massive sandstone; floor, fire clay.

The bed was measured and sampled by J. S. Burrows on October 4, 1905, as described below:

Sections of coal bed in prospect pit on Big Black Mountain.

Section	A		B	
Laboratory No	2271		2272	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Coal	1	6	0	7
Mother coal	0	¼	0	⅛
Coal	4	7	2	1
Coal, hard	..	..	2	2
Floor, fire clay.				
Thickness of bed	6	1¼	4	10⅛
Thickness of coal sampled	6	1¼	4	10⅛

Section A (sample 2271) was measured in a prospect hole, 1 mile south of Gilliam's rock house; the sample was from an old rib, 1 foot from its face, 20 feet from the outcrop.

Section B (sample 2272) was measured from the face of Gilliam's rock house prospect hole, 25 feet from the outcrop.

Sample 2270 was taken from loose coal lying in the ravine below the point at which 2271 was taken.

Notes.—These samples were taken from undeveloped prospects, 15 miles from a railroad. The coal is slabby, hard, bright, lustrous, and little affected by long exposure to weather.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 124; Bureau of Mines Bull. 23, pp. 64, 168, 169; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 124; Bureau of Mines Bull. 13, pp. 136, 274; coking tests: U. S. Geol. Survey Bull. 290, p. 125; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 103; also U. S. Geol. Survey Bull. 290, p. 123.

POOR FORK. MINE ON THE ANTHONY BLAIR TRACT.

Sample.—Bituminous coal; eastern Kentucky field; analysis No. 4525 (p. 103).

Mine.—On the Anthony Blair tract, near Poor Fork.

No other information in regard to this sample was recorded.

For chemical analyses of this coal see part I of this bulletin, p. 103.

POOR FORK. MINE ON THE C. BLAIR TRACT.

Sample.—Bituminous coal; eastern Kentucky field; analysis No. 4527 (p. 103).

Mine.—On the C. Blair tract; near Poor Fork.

No other information in regard to this sample was recorded.

For chemical analyses of this coal see part I of this bulletin, p. 103.

POOR FORK. MINE ON THE JOHN CREEK TRACT.

Sample.—Bituminous coal; eastern Kentucky field; analysis No. 4528 (p. 103).

Mine.—Mine on the John Creek tract; near Poor Fork.

No other information in regard to this sample was recorded.

For chemical analyses of this coal see part I of this bulletin, p. 103.

POOR FORK. MINE ON THE REBECCA CREEK TRACT.

Sample.—Bituminous coal; eastern Kentucky field; analysis No. 4526 (p. 103).

Mine.—On the Rebecca Creek tract; near Poor Fork.

No other information in regard to this sample was recorded.

For chemical analyses of this coal see part I of this bulletin, p. 103.

HOPKINS COUNTY.

BARNSLEY. BARNSLEY MINE.

Sample.—Bituminous coal; western Kentucky field; (Kentucky No. 3) analyses Nos. 1361, 1367 (p. 104).

Mine.—Barnsley; at Barnsley, on the Louisville & Nashville Railroad.

Coal bed.—The workable coal of western Kentucky is mainly in two beds, designated in the report of the State Geological Survey as No. 9 and No. 11. Of these, No. 9 is the more persistent and furnishes by far the larger part of the output of this field. This bed has an average thickness of 5 feet, seldom varying more than 6 inches from the average. As a rule, it is found at depths less than 200 feet. The Barnsley mine in 1904 was working this coal from the outcrop.

Two sections were measured and sampled in this mine by J. S. Burrows on November 2, 1904, as shown below:

Sections of coal bed in Barnsley mine at Barnsley.

Section	A	B
Laboratory Nos	1361	1367
	Ft. in.	*Ft. in.*
Coal	1 2	4 6
Sulphur	Trace.	Trace.
Coal	1 4	Trace.
Sulphur	Trace.	Trace.
Coal	1 10	Trace.
Total thickness of bed	4 4	4 6
Total thickness of coal sampled	4 4	4 6

Section A (sample 1361) was measured in the third west entry.

Section B (sample 1367) was measured in a break-through between the third and fourth north entries.

Notes.—In section A the "sulphur" partings are very thin bands of pyrite. They are not persistent; where present, they vary greatly in thickness and relative position.

In 1904, the coal was shipped to southern cities for domestic and factory use. The slack had been made into coke.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 665; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 64; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1141; Bull. 261, p. 99; Bureau of Mines Bull. 13, pp. 136, 274; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1470; Bull. 261, p. 70; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1349; Bull. 261, p. 126.

For chemical analyses see part I of this bulletin, p. 104; also U. S. Geol. Survey Bull. 261, p. 47.

EARLINGTON. NO. 11 MINE.

Sample.—Bituminous coal; western Kentucky field; (Kentucky No. 2) analyses Nos. 1365, 1366 (p. 104).

Mine.—No. 11; at Earlington, on the Louisville & Nashville Railroad.

Coal bed.—The coal worked at this mine is called in the State geological reports coal No. 11. It is one of the two important workable coal beds of this part of Kentucky, the other being bed No. 9. Bed No. 11 is much more irregular than No. 9, and at most of the mines has a thickness of 6 feet or more. The bed is reported as always having a clay parting from one-fourth inch to 2 or 3 inches thick, and it is much disturbed by rolls, clay slips, etc. As a rule, it is not under deep cover, usually outcropping at the surface and extending to depths of less than 100 feet. At mine No. 11, the coal is reached by a shaft 60 feet deep and by entries from the outcrop.

Two sections were measured and sampled by J. S. Burrows on November 3, 1904, as shown below:

Sections of coal bed in No. 11 mine, at Earlington.

Section	A		B	
Laboratory No.	1365		1366	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	8	1	5
Sulphur	0	¼	0	¼
Coal	2	11¾	1	2¼
Fire clay [a]	0	3¼	0	2
Coal [b]	2	4	2	6½
Thickness of bed	7	3¼	5	4
Thickness of coal sampled	7	0	5	2

[a] Not included in sample.

[b] This bench of coal contains irregular streaks and knife blades of "sulphur."

Section A (sample 1365) was measured in room 10 off the third west entry.

Section B (sample 1366) was measured in room 15 off the fourth west entry.

Notes.—The capacity of the mine in 1904 was 1,000 tons of coal daily, the larger part being taken by the Louisville & Nashville Railroad for engine coal. Most of the remainder went to various southern cities for factory use. The slack was coked at the mine. The sizes produced were lump, nut, pea, and slack, the proportion of lump and nut (over ¾-inch screen) being three times that of pea and slack.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 649; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 64; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1444; Bull. 261, p. 159; washing tests: U. S. Geol. Survey Bull. 332, p. 159; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1348; Bull. 261, p. 126; Bull. 332, p. 159.

For chemical analyses see part I of this bulletin, p. 104; also U. S. Geol. Survey Prof. Paper 48, p. 232; Bull. 261, p. 46.

JOHNSON COUNTY.

FLAMBEAU. FLAMBEAU MINE.

Sample.—Cannel coal; eastern Kentucky field; analyses Nos. 7132, 7133 (p. 105).

Mine.—Flambeau; a drift mine 400 yards up the mountain side southeast of Flambeau, on the Big Sandy division of the Chesapeake & Ohio Railroad.

Coal bed.—Locally called Cannel; about 300 feet above the Miller Creek bed. The roof is soft gray shale, as is also the floor.

The bed was measured and sampled by G. S. Pope on January 2 and 4, 1909, as described below:

Sections of coal bed in Flambeau mine, southeast of Flambeau.

Laboratory No.	7132		7133	
Roof, soft gray slate.	*Ft.*	*in.*	*Ft.*	*in.*
Niggerhead coal[a]	0	5	..	..
Cannel coal	4	3½	1	6¼
Bituminous coal[a]	0	4	0	9
Floor, soft slate.				
Thickness of bed	5	½	2	3¼
Thickness of coal sampled	4	3½	1	6¼

[a] Not included in sample.

Sample 7132 was taken 250 feet southeast of the opening on chain pillar in entry 5.

Sample 7133 was taken 150 feet southeast of the opening on chain pillar in main entry 1.

The samples were dry when taken.

Notes.—The cannel coal is, as a rule, clean, carrying no streaks of impurities ot any kind. The cannel coal only was sampled as the bituminous coal is marketed separately. In 1909 the mine had been operated about 3 years, the last year prior to time of sampling having been spent in drawing pillars. The time estimated to complete the mining of the remaining coal was about three months. The daily output was 55 tons.

For chemical analyses of this coal see part I of this bulletin, p. 105.

LESLEY (EAST POINT POST OFFICE). LESLEY MINE.

Sample.—Bituminous (cannel) coal; eastern Kentucky field; analysis No. 5437 (p. 105).

Mine.—Lesley; at Lesley (East Point post office).

Coal bed.—Lesley. Carboniferous age, Pottsville formation.

The bed was measured and sampled by David White.

Further information regarding this sample is not available.

For chemical analyses of this coal see part I of this bulletin, p. 105.

PAINTSVILLE. MILLER CREEK COUNTRY BANK.

Sample.—Bituminous coal; eastern Kentucky field; (Kentucky No. 6) analyses Nos. 2405, 2406 (p. 105).

Location.—Miller Creek country bank, 5 miles southeast of Paintsville, on the Chesapeake & Ohio Railroad.

Coal bed.—Miller Creek. Carboniferous age, Pottsville (?) formation. Thickness, fairly uniform, averaging 4 feet; dip, slight, about 5 feet in 100 feet northwest; roof, hard gray laminated shale; floor, hard fire clay; both roof and floor are good. The bed has no partings and carries few streaks or bands of sulphur.

The bed was measured and sampled at two points in the mine by W. J. von Borries and J. W. Groves on October 30, 1905. Section A (sample 2405) represented 3 feet

8 inches of clean coal. Section B (sample 2406) represented 3 feet 6 inches of clean coal.

Section A (sample 2405) was measured in right entry 1, 100 feet west of the drift mouth.

Section B (sample 2406) was measured in the main entry, 140 feet west of the drift mouth.

Note.—This coal is hard and in appearance resembles the splint coal from Harlan County, Ky.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 126; Bureau of Mines Bull. 23, pp. 64, 169; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 127; Bureau of Mines Bull. 13, pp. 136, 274; coking tests: U. S. Geol. Survey Bull. 290, p. 128; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 105; also U. S. Geol. Survey Bull. 290, p. 126.

VAN LEAR. VAN LEAR NOS. 1, 2, 3, AND 4 MINES.

Sample.—Bituminous coal; eastern Kentucky field; analyses Nos. 10548, 10549, 10550, 10551, 10552, 10553 (p. 105).

Mine.—Van Lear Nos. 1, 2, 3, and 4; drift and slope mines at Van Lear, on the Big Sandy Division of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the No. 1 (Miller Creek). It is a splint bituminous coal of Carboniferous age, Kanawha formation. Average thickness at this mine 4 feet; roof, gray shale with smooth surface and a cap rock of 3 feet above the coal; floor, hard clay or shale with smooth surface.

The bed was measured and sampled at five points by J. J. Rutledge on June 1, 1910, as described below:

Sections of coal bed in Van Lear Nos. 1, 2, 3, and 4 mines at Van Lear.

Section	A		B		C		D		E	
Laboratory No.	10548		10549		10551		10552		10553	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (splint)	2	10	2	11	1	6	2	0	1	11
Mother coal	..	..	0	⅛	..	..	..	..	..	..
Coal	1	9½	1	6½	1	6	1	3	1	9
Floor, hard clay or shale.										
Thickness of bed	4	7½	4	5⅝	3	0	3	3	3	8
Thickness of coal sampled	4	7½	4	5⅝	3	0	3	3	3	8

Section A (sample 10548) was taken at the face of right heading 1 in No. 1 mine.

Section B (sample 10549) was taken at the face of left heading 2 off the west opening of No. 1 mine.

Section C (sample 10551) was taken at the face of the first right entry in No. 2 mine.

Section D (sample 10552) was taken at the face of the main entry in No. 3 mine.

Section E (sample 10553) was taken at the face of the main entry in No. 4 mine.

A composite sample was made by mixing the face samples 10548 and 10549 for an ultimate analysis, the results of which are shown under laboratory number 10550.

Notes.—In 1910 the coal at these mines was undercut with chain machines and shot down with black powder. The tipple was provided with both bar and knocker screens with 1½ to 4 inch openings, and all the coal was screened. This coal is rather hard and is seemingly a splint coal. It is clean in appearance, and as mined by chain machines it produces very large lumps and is considered a good stocking coal. These were new mines, having started to ship coal only in February, 1910. During May, 1910, 18,000 short tons was shipped. The capacity of the mines was 1,500 tons, the average output being 700 tons. The output was to be derived almost entirely from advance work for some time.

For chemical analyses of this coal see part I of this bulletin, p. 105.

LETCHER COUNTY.

JEWEL. POTTER MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 3828 (p. 105).

Mine.—Potter; on Elkhorn Creek near the mouth of Bens Branch, 3 miles southwest of Jewel post office. This bank is 15 miles from the Chesapeake & Ohio Railroad at Hellier, Ky.

Coal bed.—Upper Elkhorn. Carboniferous age, in coal-bearing rocks, possibly the same as the Kanawha formation.

The bed was measured and sampled by R. W. Stone in September, 1906, as shown below.

Section of coal bed in Potter mine, 3 miles southwest of Jewel.

Laboratory No	3828	
Roof, shale.	*Ft.*	*in.*
Coal, solid	3	6
Clay [a]	0	10
Coal, solid	4	6
Thickness of bed	8	10
Thickness of coal sampled	8	0

[a] Not included in sample.

The sample was taken at the face of a 20-foot drift which had not been worked in six months, and represented the entire bed, excluding the clay parting.

Note.—This is a high-grade coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 105; also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 348, p. 11.

MUHLENBERG COUNTY.

CENTRAL CITY. CENTRAL MINE.

Sample.—Bituminous coal; western Kentucky field, (Kentucky No. 7) analyses Nos. 2453, 2454 (p. 106).

Mine.—Central; a shaft mine at Central City, on the Illinois Central Railroad.

Coal bed.—No. 9 of the Kentucky Geological Survey. Carboniferous age, Pottsville (?) formation. Thickness, at this mine rather uniform, averaging 5 feet; dip, slight; roof, black laminated shale; in places the roof is a massive shale; floor, gray laminated shale; cover for the most part about 40 feet thick.

The bed was measured and sampled at two points in the mine by J. W. Groves, as described below:

Sections of coal bed in Central mine at Central City.

Section	A		B	
Laboratory No	2453		2454	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	1	9
Mother coal	0	1/8	..	..
Sulphur [a]	..	..	0	1
Coal	1	3	1	5
Mother coal	0	1/4	..	..
Sulphur	..	..	0	1/8
Coal	1	10	0	11
Sulphur [a]	..	..	0	1/4
Coal	..	..	0	9
Floor, gray shale.				
Thickness of bed	4	7 3/8	4	11 3/8
Thickness of coal sampled	4	7 3/8	4	10 1/8

[a] Not included in sample.

Section A (sample 2453) was measured in room 43, off north entry 14, 1¼ miles northeast of the shaft.

Section B (sample 2454) was measured in room 9, off south entry 14, 1¼ miles south of the shaft.

Note.—The coal from this mine, like that from some others in this field, is hard and brittle and contains many thin streaks of sulphur.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 129; Bureau of Mines Bull. 23, pp. 64, 169; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 130; Bureau of Mines Bull. 13, pp. 137, 274; coking tests: U. S. Geol. Survey Bull. 290, p. 131; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 106; also U. S. Geol. Survey Bull. 290, p. 129.

OHIO COUNTY.

McHenry. Broadway Mine.

Sample.—Bituminous coal; western Kentucky field; (Kentucky No. 9) analyses Nos. 3722, 3723 (p. 106).

Mine.—Broadway; a shaft mine 2 miles west of McHenry, on the Illinois Central Railroad.

Coal bed.—No. 9 of the Kentucky Geological Survey. Carboniferous age, Pottsville (?) formation. Thickness, fairly uniform, averaging at this mine 4 feet 6 inches; roof, gray shale; floor, hard fire clay. The coal was mined at a depth of 50 feet.

The bed was measured and sampled at two points by J. W. Groves and K. M. Way on September 6, 1909, as described below:

Sections of coal bed in Broadway mine, 2½ miles west of McHenry.

Section	A		B	
Laboratory No	3722		3723	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	1	2
Bone coal	0	1	..	..
Sulphur	..	..	[a] 0	1½
Coal	0	6	1	1
Mother coal	0	¼	0	½
Coal	0	4	0	5½
Sulphur	[a] 0	⅛	0	⅛
Coal	1	4	1	2
Mother coal	0	½	..	..
Sulphur	..	..	0	⅛
Coal	0	6	0	5
Floor, fire clay.				
Thickness of coal bed	4	5⅞	4	5¾
Thickness of coal sampled	4	5¾	4	4¼

[a] Not included in sample.

Section A (sample 3722) was measured in room 4, off first west entry, 200 feet west of the foot of the shaft.

Section B (sample 3723) was measured in north main entry, 550 feet north of the shaft.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 163; Bureau of Mines Bull. 23, pp. 65, 169; washing tests: U. S. Geol. Survey Bull. 332, p. 163; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 163; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74; Bull. 332, p. 163.

For chemical analyses, see part I of this bulletin, p. 106; also U. S. Geol. Survey Bull. 332, p. 162.

PIKE COUNTY.

HELLIER. GREENOUGH MINE.

Sample.—Bituminous (coking) coal; Russell Fork field; analysis No. 3708 (p. 106).

Mine.—Greenough; on Marrowbone Creek, just above mouth of Cassell fork, near Hellier post office, on the Chesapeake & Ohio Railroad.

Coal bed.—Upper Elkhorn. Carboniferous age; in a coal-bearing series possibly equivalent to the Kanawha formation. The bed has a shale roof and floor. At the time of sampling a single entry had been driven 600 feet.

The bed was measured and sampled on September 1, 1906, by R. W. Stone, as shown below:

Section of coal bed in Greenough mine, near Hellier.

Laboratory No.	3708	
Roof, clay and shale.	*Ft.*	*in.*
Coal, solid	0	10
Mother coal	0	¼
Coal, solid	3	0
Floor, shale.		
Thickness of bed	3	10¼
Thickness of coal sampled	3	10¼

The sample represented the entire thickness of the bed, which is a high-grade coking coal. The sample was taken at the face of the main heading, 600 feet from the entry.

For chemical analyses of this coal see part I of this bulletin, p. 106: also U. S. Geol. Survey Bull. 316, p. 52; Bull 348, p. 72.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 348, p. 72.

HELLIER. PIKE MINE.

Sample.—Bituminous (coking) coal: Russell Fork field; analyses Nos. 6928, 6929 (Ann Arbor No. 3); analyses Nos. 3705, 3706, 3702 (pp. 106, 107).

Mine.—Pike; 1 mile southwest of Hellier at the head of Marrowbone Creek, on the Chesapeake & Ohio Railroad.

Coal bed.—Lower Elkhorn. Carboniferous age, possibly same as the Kanawha formation. The bed has two benches. The roof and the floor are shale.

The bed was measured and sampled by R. W. Stone on September 1, 1906, as described below.

Sample 3702 represented only 22 inches of laminated coal from the upper bench. It was made up of two samples mixed in equal parts, one taken from the face of the main heading and one taken off right heading 1.

Sample 3706, representing 32 inches of solid coal, and sample 3705, representing the whole bed (1 foot 10 inches of laminated coal, underlain with 2 feet 8 inches of solid coal) were taken at the working face of the main heading, 720 feet from the entry.

The bed was also measured and sampled by G. S. Pope at two points on December 15, 1908, as described below:

Sections of coal bed in Pike mine, 1 mile southwest of Hellier.

Laboratory No.	6928		6929	
Roof, soapstone and sandstone	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	3½	1	0
Bone	0	⅝	0	⅝
Coal	1	0	0	⅝
Bony coal	0	¾	..	..
Mother coal	..	..	0	¼
Coal	0	7⅛	0	6½
Mother coal	0	½	Streak.	
Coal	0	8	0	6⅛
Mother coal	0	½	0	¼
Coal	1	¼	1	5½
Mother coal	0	⅝	..	..
Coal	0	2⅛	..	..
Floor, black slate, sandstone.				
Thickness of bed	4	0	3	7⅞
Thickness of coal sampled	4	0	3	7⅞

Sample 6928 was taken 500 feet south and 600 feet west of the opening, in the first right heading, 75 feet from the outcrop.

Sample 6929 was taken 1,600 feet south of the opening, in the main heading at the fourth right parallel entry.

Notes.—The coal from near the top "soapstone" has a very soft, laminated structure and the fragments are smooth and shiny. The coal below gradually assumes the regular bituminous appearance. No "sulphur" bands were found. In 1904 the coal was undercut by machines. The usual sizes of coal loaded were slack, lump, and run-of-mine. The daily output was between 300 and 350 tons.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 85, 47.

For chemical analyses, see part I of this bulletin, pp. 106, 107, also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 348, p. 11.

HELLIER. MUSGROVE PROSPECT.

Sample.—Bituminous coal; Russell Fork field; analysis No. 3829 (p. 107).

Location.—Musgrove prospect, at the head of the Cassell Fork of Marrowbone Creek, 2½ miles west of Hellier, and 2½ miles from the Chesapeake & Ohio Railroad.

Coal bed.—Flatwoods. Carboniferous age; approximately 1,300 feet above the Lee conglomerate; probably Kanawha formation. Roof and floor, shale.

The bed was measured and sampled by R. W. Stone in September, 1906, as shown below:

Section of coal bed in prospect, 2½ miles west of Hellier.

Laboratory No.	3829	
Roof, shale.	*Ft.*	*in.*
Bony coal	0	4
Clay[a]	0	3
Coal	1	2
Clay[a]	0	½
Coal	0	3
Clay[a]	0	½
Coal	0	6
Clay[a]	0	¼
Coal	1	2
Clay[a]	0	¼
Coal	3	7
Clay[a]	2	4
Coal and bone[a]	0	6
Coal[a]	1	2
Clay, blue[a]	2	6
Coal[a]	0	7
Bone[a]	0	5
Coal[a]	0	4
Shale, carbonaceous[a]	0	6
Coal[a]	1	3
Bony coal[a]	0	3
Mother coal[a]	0	½
Coal[a]	0	3
Clay[a]	0	½
Coal and bone[a]	0	10
Floor, shale.		
Thickness of bed	16	4½
Thickness of coal sampled	6	8

[a] Not included in sample.

Notes.—The coal in the prospect seemed to be fairly fresh, clean, and dry; a sample was taken of the upper 6½ feet. The lower half of the bed was not sampled because it is so broken by clay partings as to be of little value. The coal sampled is high grade, and probably coking.

For chemical analyses of this coal, see part I of this bulletin, p. 107; also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 348, p. 34.

REGINA. COLEMAN MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 3662 (p. 107).

Mine.—Coleman; a drift mine in Coleman Hollow, opposite the mouth of the Marrowbone Creek, near Regina post office, on the Chesapeake & Ohio Railroad.

Coal bed.—Millard. The bed is of Carboniferous age and lies in coal-bearing rocks possibly equivalent to the Norton formation. The bed has a sandy shale roof and sandstone floor and lies on 50 feet of heavy sandstone. In 1906 a drift had been driven 125 feet.

The bed was measured and sampled by R. W. Stone on August 30, 1906, as shown below:

Section of coal bed in Coleman mine, near Regina.

Laboratory No.	3662	
Roof, sandy shale.	*Ft.*	*in.*
Coal	2	1
Clay	0	10
Coal	0	5
Bone	0	4
Coal	0	8
Floor, sandstone.		
Thickness of bed	4	4
Thickness of coal sampled	4	4

The sample was taken at the face of the drift, 125 feet from the entry. In 1906 this small mine had been open 10 years and a few tons of coal were being taken every winter. The face sampled had been exposed to the air for six months, but probably was little affected by weathering. The entire thickness of the bed was included in the sample.

For chemical analyses of this coal, see part I of this bulletin, p. 107; also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 348, p. 34.

REGINA. MARTIN BANK.

Sample.—Bituminous (coking) coal; Russell Fork field; analysis No. 3663 (p. 107).

Location.—Martin bank, a drift opening at the right fork of Road Creek, 2 miles east of Regina post office, on the Chesapeake & Ohio Railroad.

Coal bed.—Lower Elkhorn. Carboniferous age, Lee formation (?) or equivalent (?). Roof, shale; floor, probably bone, closely underlain with sandstone.

The bed was measured and sampled by R. W. Stone in August, 1906, as shown below:

Section of coal bed in Martin bank, 2 miles east of Regina.

Laboratory No.	3663	
Roof, slate.	*Ft.*	*in.*
Coal, laminated [a]	1	3
Coal, solid	4	1
Floor, bone.		
Thickness of bed	5	4
Thickness of coal sampled	4	1

[a] Not included in sample.

The sample was collected at the face of the drift, 40 feet from the entry. In 1904 coal was mined for family use in small amounts and only in winter, so that the face sampled was probably slightly weathered. The laminated coal was excluded for the reason that it crumbles and is high in ash.

For chemical analyses of this coal, see part I of this bulletin, p. 107; also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 348, p. 34.

REGINA. MOORE BANK.

Sample.—Bituminous (coking) coal; Russell Fork field; analysis No. 3661 (p. 107).

Location.—Moore bank; a drift opening on Pond Creek just below the mouth of the Laurel branch, 4 miles south of Regina, on the Chesapeake & Ohio Railroad.

Coal bed.—Lower Elkhorn. Carboniferous age, in a coal-bearing formation possibly equivalent to the Norton formation of Virginia. Roof, shale.

The bed was measured and sampled by R. W. Stone on August 29, 1906. The bed has an upper bench of laminated coal 16 inches thick, and a lower bench of solid coal 3 feet thick, the total thickness being 4 feet 4 inches.

The sample represented the whole thickness of the bed and was taken at the face of the drift 30 feet from the entry; it may have been slightly weathered, as coal had not been mined in several months.

Notes.—The coal cokes. In 1906 the bed was developed by a drift 35 feet long.

For chemical analyses of this coal see part I of this bulletin, p. 107; also U. S. Geol. Survey Bull. 316, p. 52; Bull. 348, p. 72.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 348, p. 11.

UNION COUNTY.

STURGIS. BELL MINE.

Sample.—Bituminous coal; western Kentucky field; (Kentucky No. 8) analyses Nos. 3678, 3679 (p. 107).

Mine.—Bell; a slope mine, 2½ miles southwest of Sturgis, on the Illinois Central Railroad.

Coal bed.—No. 1 of the Kentucky Geological Survey, often designated locally the Bell. Carboniferous age. Pottsville (?) formation. Thickness, fairly uniform, averaging 2 feet 8 inches at this mine; dip, slight; roof, soft shale, ½ inch thick, with laminated shale above; floor, hard fire clay.

The bed was measured and sampled at two points in the mine by F. B. Tough on September 1, 1906, as described below:

Sections of coal bed in Bell mine, 2½ miles southwest of Sturgis.

Section	A		B	
Laboratory No	3678		3679	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	3	0	10½
Mother coal	0	1	0	½
Coal	1	0	0	10
Mother coal	0	¾	0	¼
Coal	1	2½	0	5
Mother coal	..	..	0	⅛
Coal	..	..	0	7
Floor, fire clay.				
Thickness of bed	2	7¼	2	9⅜
Thickness of coal sampled	2	7¼	2	9⅜

Section A (sample 3678) was measured in left entry 1, 100 feet north from the drift at the foot of the slope.

Section B (sample 3679) was measured in room 1, left entry 1, 60 feet north from the drift at the foot of the slope.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 160; Bureau of Mines Bull. 23, pp. 64, 65, 169;

coking tests: U. S. Geol. Survey Bull. 332, p. 160; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 65, 68, 70, 72, 74, Bull. 332, p. 161.

For chemical analyses see part I of this bulletin, p. 107; also U. S. Geol. Survey Bull. 332, p. 160.

WEBSTER COUNTY.

Wheatcroft. Wheatcroft Mine.

Sample.—Bituminous coal; western Kentucky field; (Kentucky No. 4) analyses Nos. 1382, 1384 (p. 107).

Mine.—Wheatcroft; a shaft mine, at Wheatcroft, on the Illinois Central Railroad.

Coal bed.—No. 11. At this point it lies from 40 to 60 feet below the surface, and is reached by a 40-foot shaft. The bed is much broken up by partings of fire clay and sulphur, and has to be carefully mined to insure a fairly clean product.

Two sections of the bed were measured and sampled by J. S. Burrows, in 1904, as shown below:

Sections of coal bed in Wheatcroft mine at Wheatcroft.

Section	A		B	
Laboratory No	1384		1382	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	11	1	0
Fire clay [a]	0	1	0	1
Coal	2	8	2	10
Fire clay [a]	0	2	0	1
Coal	0	8	0	10
Sulphur [a]	0	1	0	½
Coal	1	2	1	2
Thickness of bed	5	9	6	½
Thickness of coal	5	5	5	10

[a] Not included in sample.

Section A (sample 1382) was measured in room 8 off the west shaft entry.

Section B (sample 1384) was measured at the face of the second west entry.

Notes.—In 1904 most of the output was shipped to southern towns and ports for making steam; some was used by the Illinois Central Railroad for locomotive fuel.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 673; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 64; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1471; Bull. 261, p. 70; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1350; Bull. 261, p 126.

For chemical analyses see part I of this bulletin, p. 107; also U. S. Geol. Survey Prof. Paper 48, p. 234; Bull. 261, p. 47.

Wheatcroft. No. 5 Mine.

Sample.—Bituminous coal; western Kentucky field; (Ann Arbor No. 11) analysis No. 7441 (p. 108).

Mine.—No. 5; a shaft mine, 1½ miles east of Wheatcroft, on the Illinois Central Railroad.

Coal bed.—Owen No. 11. Carboniferous age, Pottsville (?) group. Roof, coal and dirt (16 inches); floor, fire clay. The bed is about 5 feet thick.

The bed was measured and sampled by P. M. Riefkin on March 18, 1909, as shown on the following page.

Section of coal bed in No. 5 mine, 1¼ miles east of Wheatcroft.

Laboratory No	7441	
Roof.	*Ft.*	*in.*
Coal	0	10¼
Mother coal	0	¼
Coal	0	3¾
Mother coal	0	⅛
Coal	0	2 5/16
Mother coal	0	¼
Coal	0	10⅛
Mother coal	0	¼
Coal	1	8¾
Bony coal	0	3/16
Coal	0	1¾
Mother coal	0	⅛
Coal	0	9
Floor, fire clay.		
Thickness of bed	4	11⅛
Thickness of coal sampled	4	11⅛

The sample was taken at a point 500 feet southeast of the opening in room 5 off south heading 1, off east entry.

Notes.—Roof is poor; a combination of bone coal and dirt, and must be carefully watched. In 1909 the sizes prepared were: Nut, over 1 inch, through 2½-inch screen; lump, over 2½-inch screen; and slack. Long-wall mining machines were used.

For chemical analyses of this coal see part I of this bulletin, p. 108; also Bureau of Mines Bull. 6, p. 44.

WHITLEY COUNTY.

BARTHELL. NO. 1 MINE.

Sample.—Bituminous coal; eastern Kentucky field; analysis No. 10062 (p. 108).

Mine.—No. 1; at Barthell, Whitley County.

Coal bed.—No. 2. The bed is about 4 feet thick with a sulphur parting.

The bed was measured and sampled at one point by J. J. Rutledge, March 1, 1910, as described below:

Section of bed in No. 1 mine at Barthell.

Laboratory No	10062	
Roof.	*Ft.*	*in.*
Coal	2	2½
Sulphur [a]	0	¼
Coal	1	9¼
Thickness of bed	4	0
Thickness of coal sampled	3	11¾

[a] Not included in sample.

The sample was taken in room 14, sixth left entry. It was dry when taken.

For chemical analyses of this coal see part I of this bulletin, p. 108.

KENSEE. MAIN JELLICO MINES.

Sample.—Bituminous coal; eastern Kentucky field; (Kentucky special) analyses Nos. 1329, 1330 (p. 108).

Mine.—Main Jellico; drift mines at Kensee.

Coal bed.—Jellico. Carboniferous age, Pottsville group.

Two sections of the bed were measured and sampled by J. S. Burrows on October 28, 1904. The record of sampling was not reported.

Section A (sample 1329) was measured in the new mine.

Section B (sample 1330) was measured in the old mine.

For chemical analyses of this coal see part I of this bulletin, p. 108.

MARYLAND.

ALLEGANY COUNTY.

ECKHART. OCEAN NO. 3½ MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 8769, 8770, 8771, 8843 (p. 108).

Mine.—Ocean No. 3½; a slope mine, at Eckhart, on the Cumberland & Pennsylvania and the Baltimore & Ohio Railroads.

Coal bed.—Known in this field as the Big Vein. Carboniferous age, Monongahela formation. The bed averages about 8 feet in thickness, ranging from 7 to 9 feet. The roof is of good hard shale, but in places a layer of coal is left up for a roof in advance workings. A solid cap rock lies 6 feet above the coal. The floor is an underclay with smooth surface.

The bed was measured and sampled at three points by C. A. Fisher on August 11, 1909, as described below:

Sections of coal bed in Ocean No. 3½ mine at Eckhart.

Section	A		B		C	
Laboratory No.	8770		8769		8771	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale, and coal.						
Coal (hard gray)	0	8	1	0	..	..
Coal (bright)	1	0	1	0	1	9
Bony coal	0	1	..	..	[a] 0	1½
Shale	0	3½	0	½	..	..
Coal	1	7	2	3	1	5
Coal	1	3	1	1	..	..
Shale	[a] 0	1½	[a] 0	1½	..	..
Coal	0	7	0	8	..	..
Shale	[a] 0	½	[a] 0	1	..	..
Coal	1	0	1	3	..	..
Shale	[a] 0	½	..	..	..	..
Coal	0	10	..	..	..	..
Bony coal	..	..	[a] 0	½	..	..
Coal	..	..	1	2	..	..
Floor, hard underclay.						
Thickness of bed	7	6	8	8½	3	3½
Thickness of coal sampled	7	3½	8	5½	3	2

[a] Not included in sample.

Section A (sample 8770) was cut from the face of first left heading, 50 feet from the motor road.

Section B (sample 8769) was cut from the first crosscut on motor road No. 2.

Section C (sample 8771) was cut from the face of the first left heading off the main heading.

A composite sample made by mixing samples 8769, 8770, and 8771 was taken for an ultimate analysis, the results of which are shown under laboratory number 8843.

Notes.—In 1909 the coal at this mine was undercut with hand picks and shot down with black powder. The coal was loaded as run-of-mine, the tipple having no screens. The output in 1909 was 250 tons per day, the maximum day's run being 300 tons. The output was expected to remain about the same, the entire tonnage being obtained from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 108.

ECKHART. WASHINGTON NO. 1 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 6358, 6359 (p. 109).

Mine.—Washington No. 1, a drift mine at Eckhart, on the Cumberland & Pennsylvania Railroad.

Coal Bed.—Pittsburgh. Carboniferous age, Monongahela formation. The bed at this mine is between 6¾ and 7 feet thick, with a roof of 2 feet of top coal and a shale floor.

The bed was measured and sampled on August 8, 1908, by K. M. Way, as described below:

Sections of coal bed in Washington No. 1 mine at Eckhart.

Laboratory No.	6358		6359	
	Ft.	*in.*	*Ft.*	*in.*
Roof, top coal.				
Coal	1	1½	1	2½
Bone coal	0	½	0	½
Coal	0	7	1	3¼
Shale and coal [a]	0	3	..	..
Shale [a]	..	..	0	¼
Coal	2	10¾	1	2½
Shale [a]	0	1¼	0	2
Coal	0	5½	0	6¾
Shale [a]	0	2	0	1¾
Coal	0	6	1	2
Shale	0	¼	0	¼
Coal	0	2½	1	¼
Shale	0	¼	..	..
Coal	0	2	..	..
Shale [a]	0	½	..	..
Coal	0	7½	..	..
Floor, shale.				
Thickness of bed	7	2½	6	10
Thickness of coal sampled	6	7¾	6	6

[a] Not included in sample.

Sample 6358 was taken 2,100 feet northwest from the opening in the face of Cannon's heading.

Sample 6359 was taken 2,000 feet southwest from the opening inside place for main heading.

Notes.—This is an old mine; coal almost worked out, only pillar coal remaining. Pillars are badly squeezed; roof in some places has caved for distance of 25 feet. Daily output of mine at time of sampling, 250 tons.

For chemical analyses of this coal see part I of this bulletin, p. 109.

ECKHART. WASHINGTON NO. 2 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 6356, 6357, 8863, 8864, 8865, 8932 (p. 109).

Mine.—Washington No. 2; a drift mine at Eckhart, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Known in this field as the Upper Sewickley or Tyson. Carboniferous age, Monongahela formation. The bed at this mine varies in thickness from 3 feet to 4 feet, and has a shale roof, to which the coal sticks. This shale is about 45 feet thick to the cap rock. The floor is a hard underclay with a smooth surface, to which the coal does not stick.

The bed was measured and sampled by K. M. May on August 7, 1908, as shown below:

Sections of coal bed in Washington No. 2 mine at Eckhart.

Laboratory No.	6356		6357	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale and sandstone.				
Coal	1	7¼	0	7¼
Sulphur	0	⅛	..	..
Shale	..	..	0	⅛
Coal	0	5½	0	11½
Shale	0	⅛	0	⅛
Coal	1	4¾	1	6½
Shale and bone	0	½	0	½
Coal	0	5	0	4
Thickness of bed	3	11¼	3	6
Thickness of coal sampled	3	11¼	3	6

Sample 6356 was taken 2,800 feet west of the opening in room 6, off the first right entry off the fourth south entry.

Sample 6357 was taken 3,600 feet south of the face of the opening in the fifth south heading.

The bed was also measured and sampled at three points by J. J. Rutledge on August 18, 1909, as described below:

Sections of coal bed in Washington No. 2 mine at Eckhart.

Section	A		B		C	
Laboratory No	8865		8864		8863	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	10	2	9	3	5½
Shale (dark)	0	¼	[a] 0	⅜	0	⅛
Coal	0	4	0	7	0	5½
Shale (dark)	0	¼	..	..	..	..
Coal	0	3	..	..	..	..
Floor, hard underclay.						
Thickness of bed	3	5½	3	4⅜	3	11⅛
Thickness of coal sampled	3	5½	3	4	3	11⅛

[a] Not included in sample.

Section A (sample 8865) was cut from the pillar of room No. 4 on south entry No. 18.

Section B (sample 8864) was cut from the face of room No. 2 in first right off fourth south entry.

Section C (sample 8863) was cut from the face of room No. 3 on south entry 7 off the main entry.

A composite sample was made by mixing face samples 8863, 8864, and 8865 for an ultimate analysis, the results of which are shown under laboratory No. 8932.

Notes.—In 1908 the coal at this mine was cut with hand picks in the upper part of the bed and shot down with black powder. The roof in this method does not get mixed with the coal in mining. There were no screens at the tipple, the coal all being loaded as run-of-mine. It was picked by hand on the mine cars and on the railroad cars as it was loaded. The capacity of the mine at the time of sampling in 1909 was 800 tons, the average daily output being 500 tons. The immediate future output was to be derived largely from pillars.

For chemical analyses of this coal see part I of this bulletin, p 109.

FROSTBURG. TYSON NO. 9 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 6361, 6362, 6363 (p. 109).

Mine.—Tyson No. 9; a drift mine 1½ miles northeast of Frostburg, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Upper Sewickley or Tyson. Carboniferous age, Monongahela formation. The bed is about 3 feet thick with shale roof and floor.

The bed was measured and sampled at two points by K. M. Way on August 6, 1908, as shown below:

Sections of coal bed in Tyson No. 9 mine, 1½ miles south of Frostburg.

Laboratory No	6361		6663		6362	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9¾	0	3	..	..
Shale	0	⅛	..	..	..	..
Sulphur	..	..	0	¼	..	..
Coal	0	9½	2	1¼	2	4½
Shale	0	⅛	0	⅜	0	¼
Coal	0	2¾	0	8½	0	6¾
Shale	0	¼	..	..	..	..
Coal	1	1¼	..	..	..	..
Floor, shale.						
Thickness of bed	2	11¾	3	1⅜	2	11½
Thickness coal sampled	2	11¾	3	1⅜	2	11½

Sample 6361 was taken 2,200 feet southeast of the opening in the face of the fifth right blind opening.

Sample 6363 was taken 950 feet northeast of the opening in room 8 on first right entry off first left entry.

Sample 6362 was taken in left heading 3, off right heading 1, B opening, 1,000 feet southeast of mine mouth.

Notes.—In 1908 there were two tipples at this mine, one for loading coal and the other for coaling engines on the Cumberland & Pennsylvania branch. The mine had three openings. Daily output in 1908 was 115 tons.

For chemical analyses of this coal see part I of this bulletin, p. 109.

FROSTBURG. TYSON MINE.

Sample.—Semibituminous coal; Georges Creek field; analysis No. 6354 (p. 109).

Mine.—Tyson; pumping shaft, 1½ miles southwest of Frostburg, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Upper Sewickley or Tyson. Carboniferous age, Monongahela formation. The bed is 2 feet 10 inches thick with a sulphur parting ⅛ inch thick. Roof, sandstone; floor, bastard fire clay.

The belt was measured and sampled on August 4, 1908 by K. M. Way as described below:

Section of coal bed in Tyson mine, 1½ miles southwest of Frostburg.

Laboratory No.	6354	
Roof, sandstone.	*Ft.*	*in.*
Coal	2	2
Sulphur	0	⅛
Coal	0	8½
Floor, bastard fire clay:		
Thickness of bed	2	10⅝
Thickness of coal sampled	2	10⅝

The sample was taken 50 feet from the shaft in the face of the new main heading.

For chemical analyses of this coal see part I of this bulletin, p. 109.

FROSTBURG. OCEAN NO. 3 (HOFFMAN) MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 6352, 6353, 8757, 8758, 8759, 8760, 8761, 8762, 8840, 8841 (p. 109).

Mine.—Ocean No. 3 (Hoffman); 2 miles south of Frostburg, on the Cumberland & Pennsylvania and the Baltimore & Ohio railroads.

Coal bed.—Big Vein or Pittsburgh. Carboniferous age, Monongahela formation. Roof, 2 feet of top coal, above which is shale; floor, shale. The bed varies in thickness from 7½ to 9 feet, averaging 8½ feet.

The bed was measured and sampled at two points by K. M. Way on August 4, 1908, as described below:

Sections of bed in Ocean No. 3 mine, 2 miles south of Frostburg.

Laboratory No.	6352		6353	
Roof, top coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	6	11½	3	3
Shale	[a] 0	1¼	..	..
Bone	..	..	0	1½
Coal	0	5¼	1	4½
Shale	[a] 0	1¾	0	¼
Coal	1	¾	0	9½
Shale	0	¼	[a] 0	1½
Coal	0	11½	0	6½
Shale	..	..	[a] 0	1¼
Coal	..	..	0	7
Shale	..	..	0	¼
Coal	..	..	1	4
Floor, shale.				
Thickness of bed	9	8¼	8	3¼
Thickness of coal sampled	9	5¼	8	½

[a] Not included in sample.

Sample 6352 was taken 13,000 feet southwest of the opening in room 2 on the fifth right Klondike heading.

Sample 6353 was taken 9,000 feet west of the opening in room 4 on third left off the north entry.

The bed was also measured and sampled by C. A. Fisher at six points on August 9 and 10, 1909, as described below:

Sections of coal bed in Ocean No. 3 mine, 2 miles south of Frostburg.

Section	A		B		C		D		E		F	
Laboratory No	8761		8760		8762		8757		8758		8759	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4	1	5	1	6	1	2	1	3	0	5
Coal (with pyrite bands)	..	..	..	..	1	0	..	..	..	..	..	..
Coal (bright)	5	0	4	5	..	..	3	8	4	3	3	10
Coal	1	7	1	4	..	..	1	5	1	5½	1	4
Shale [a]	0	½	0	½	..	..	0	1½	0	1	0	1
Coal (bright)	0	5	0	5	..	..	0	6	0	5	0	5
Shale [a]	0	1½	0	1½	..	..	0	1	0	1	0	1½
Coal (bright)	1	2	1	1	..	..	1	0	1	1	0	10
Bone coal [a]	0	½	0	½	..	..	0	½	0	½	0	¼
Coal	1	1	1	1	..	..	1	0	1	0	1	1
Floor, hard underclay.												
Thickness of bed	10	9½	9	11½	2	6	9	0	9	8	8	1¾
Thickness of coal sampled	10	7	9	9	2	6	8	9	9	5½	7	11

[a] Not included in sample.

Section A (sample 8761) was cut from the face of eighth right entry off Klondike entry in room No. 10.

Section B (sample 8760) was cut from the face of room No. 4, in fourth right entry off Klondike entry.

Section C (sample 8762) was cut from the face of the coal in shaft heading, 350 feet northeast from the shaft.

Section D (sample 8757) was cut from the pillar in second left entry near room No. 7.

Section E (sample 8758) was cut from the pillar of room No. 33 off the first cross heading.

Section F (sample 8759) was cut from the pillar of room No. 11 of first cross entry off Klondike entry.

Composite samples were made by mixing pillar samples 8757, 8758, and 8759, and by mixing face samples 8760, 8761, and 8762 for ultimate analyses, the results of which are shown under laboratory numbers 8840 and 8841, respectively.

Notes.—In 1909 the coal at this mine was undercut with puncher machines and shot down with black powder and a permissible explosive. The tipple had no screens, the entire output being loaded as run of mine. The coal was cleaned by one trimmer as it was loaded on the car. The output of the mine when inspected was 1,100 tons, the maximum day's run being 1,500 tons. It was estimated that the mine would continue to produce coal at this rate for 30 years in the proportion of 85 per cent from pillar coal and 15 per cent from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 110.

LORD. OCEAN NO. 7 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 4334, 4335 (Maryland No. 2), and analyses Nos. 6351, 6364, 6365, 7234, 7235, 8779, 8780, 8781, 8782, 8783, 8817, 8831, 8832, 8838, 8839, 8859, 8860, 8861 (p. 110).

Mine.—Ocean No. 7; ½ mile west of Lord and 4 miles southwest of Frostburg, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Pittsburgh, known as Big Vein. Carboniferous age, Monongahela formation. Thickness of coal at this mine, 8½ to 11 feet. Roof, shale which weathers on exposure; some coal is left up as roof for advance work; floor, hard shale. The coal has a columnar structure and carries a persistent parting.

The bed was measured and sampled at two points by J. W. Groves on December 13, 1906, as described below:

Sections of coal bed in No. 7 mine, ½ mile west of Lord.

Section	A		B	
Laboratory No.	4334		4335	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	7	0	..	..
Roof coal	..	..	[a]0	5½
Shale	[a]0	1½	..	..
Coal	[a]0	2½	6	1
Shale	[a]0	1	[a]0	¾
Coal	0	11	[a]0	2½
Shale	..	..	[a]0	1¼
Hard coal and sulphur	0	¼	..	..
Coal	1	0	0	11½
Shale	..	..	[a]0	¼
Coal	..	..	..	10½
Floor, shale.				
Thickness of bed	9	4¼	8	9¼
Thickness of coal sampled	8	11¼	7	11

[a] Not included in sample.

Section A (sample 4334) was measured in room 3, off second right (low grade) slope, 6,600 feet southwest of the slope mouth.

Section B (sample 4335) was measured in room 23, second right (middle) slope, 4,500 feet south of the mouth of the slope.

The bed was also measured and sampled on August 3, 1908, by K. M. Way at three points as described below:

Sections of coal bed in Ocean No. 7 mine, ½ mile west of Lord.

Laboratory No.	6364		6351		6365	
Roof, shale and coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	6	6½	..	..	..	..
Hard coal	..	..	0	6	0	4
Shale [a]	0	1½	..	..	..	..
Coal	0	2¾	2	7	3	6
Shale [a]	0	¾	..	..	..	..
Coal	1	0	..	..	..	..
Shale	0	½	..	..	..	..
Coal	0	11	..	..	..	..
Bone coal	..	..	0	½	0	1
Coal	..	..	3	1	3	1½
Mother coal [a]	..	..	0	1¾	..	..
Coal	..	..	0	2	..	..
Shale [a]	..	..	0	1	0	1¼
Coal	..	..	0	3½	0	3¾
Shale [a]	..	..	0	1½	0	1¾
Coal	..	..	0	11¼	1	¼
Shale [a]	..	..	0	½	0	½
Coal	..	..	0	11¾	1	¼
Floor, shale and coal.						
Thickness of bed	8	11	8	11¾	9	8¼
Thickness of coal sampled	8	8¾	8	7	9	4¾

[a] Not included in sample.

Sample 6364 was taken 1,700 feet southwest of opening in room 7, off first right midway slope.

Sample 6351 was taken 4,500 feet southeast of the opening in room 1, off fifth left midway slope.

Sample 6365 was taken 3,600 feet northeast of the opening in room 7, off third left heavy grade slope.

The bed was also measured and sampled at two points by G. S. Pope on January 28, 1909, as shown below:

Sections of coal bed in Ocean No. 7 mine, ½ mile west of Lord.

Laboratory No.	7234		7235	
	Ft.	*in.*	*Ft.*	*in.*
Roof, top coal, sandstone.				
Bone and coal[a]	0	8¾	1	2½
Coal	6	5	4	6½
Sulphur	..	..	Streak.	
Mother coal and coal mixed	..	..	0	1
Coal	0	2	1	8
Slate[a]	0	1	0	1¼
Coal	0	3¼	0	3
Slate[a]	0	1¼	0	1½
Coal	0	6¼	1	¾
Mother coal and coal mixed	0	1	..	..
"Penny" slate	Streak.			
Coal	0	2½	1	¼
Soft coal	0	3¼	..	..
"Penny" slate	..	..	Streak.	
Coal	1	¼	..	..
Floor, black shale.				
Thickness of bed	9	11½	10	¾
Thickness of coal sampled	9	½	8	7½

[a] Not included in sample

Sample 7234 was taken 2,500 feet east from opening in room 16, off second cross heading off third left heavy grade.

Sample 7235 was taken 4,600 feet south 30° east from opening in room 8, off fifth right midway slope crosscut.

The bed was also measured and sampled at 11 points by J. J. Rutledge on August 12, 13, and 17, 1909, as described below:

Sections of coal bed in Ocean No. 7 mine, ½ mile west of Lord.

Section	A		B		C		D		E		F	
Laboratory No.	8781		8832		8780		8831		8782		8779	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.												
Coal	7	0	7	6	6	9	6	7½	5	3½	5	9
Coal	..	..	..	..	..	..	..	..	0	7½	0	5¾
Coal	..	..	..	..	..	..	..	..	0	11½	0	7¾
Shale[a]	0	1	0	1	0	¼	0	1	0	1½	0	1½
Coal	0	2½	0	2¾	0	3¼	0	4	0	3	0	3½
Shale[a]	0	¾	0	3	0	1½	0	1¼	0	1¼	0	1½
Coal	1	1	0	11½	1	1½	0	11¾	0	10	0	11¾
Shale[a]	0	½	..	..	0	¼	0	¼	0	¼	0	¼
Coal	0	11½	..	..	0	11½	0	9½	0	2¼	0	11½
Shale[a]	..	..	..	..	..	..	..	..	0	¼	..	..
Coal	..	..	..	..	..	..	..	..	0	8¼	..	..
Floor, hard underclay.												
Thickness of bed	9	5¼	9	¼	9	3¼	8	11¼	9	1¼	9	4½
Thickness of coal sampled	9	3	8	8¼	9	1¼	8	8¾	8	10	9	1¼

Section	G		H		I		J		K	
Laboratory No.	8783		8817		8860		8861		8859	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.										
Coal	5	6	5	4½	5	4	5	5½	5	9
Coal	0	5	0	7	0	8	0	5¼	0	7½
Coal	0	10	0	8	0	9¾	1	2½	1	1¾
Shale[a]	0	1	0	1¼	0	1½	0	1½	0	1
Coal	0	3¼	0	3	0	2½	0	3	0	3¾
Shale[a]	0	1¼	0	1	0	2	0	1¼	0	1½
Coal	1	¾	0	11	1	2¼	0	9¾	1	3
Shale[a]	0	½	0	¼	0	¼	0	¼	0	¼
Coal	0	11½	0	11¼	1	2½	0	11¾	0	11
Floor, hard underclay.										
Thickness of bed	9	3¼	8	11¼	9	8¾	9	4¾	10	2¾
Thickness of coal sampled	9	½	8	8¾	9	5	9	1¾	10	0

[a] Not included in sample.

Section A (sample 8781) was cut from a pillar of room No. 22 off right entry 2, off midway slope.

Section B (sample 8832) was cut from the pillar off cross entry 2 off right entry 4, off midway slope.

Section C (sample 8780) was cut from the face of room No. 7 off right entry 4, off midway slope.

Section D (sample 8831) was cut from the face in room No. 3 from stub dip heading off midway slope.

Section E (sample 8782) was cut from the face in room No. 6 off straight entry between cross entries 2 and 3, off left entry 3 off the heavy grade slope.

Section F (sample 8779) was cut from the face in room No. 4 off straight heading between cross entries 2 and 3, off left entry 2 off heavy grade slope.

Section G (sample 8783) was cut from a pillar in room No. 5 off left entry 1, off heavy grade slope.

Section H (sample 8817) was cut from face of room No. 1 off right entry 3, off heavy grade slope.

Section I (sample 8860) was cut from the face of room No. 8 off right entry 1, off heavy grade slope (Pittsburgh bed).

Section J (sample 8861) was cut from a pillar in room No. 2 off left entry 4, off midway slope.

Section K (sample 8859) was cut from the solid coal in room No. 10 off left entry 5, off heavy grade slope (Pittsburg bed).

A composite sample was made by mixing the face samples 8779, 8780, 8782, 8817, 8831, 8859, and 8860 for an ultimate analysis, the results of which are shown under laboratory number 8838.

A composite sample was also made by mixing the pillar samples 8781, 8783, 8832, and 8861 for an ultimate analysis, the results of which are shown under laboratory number 8839.

Notes.—In 1909 the coal at this mine was cut with puncher machines and was shot down with black powder. The tipple was provided with bar screens with 2-inch and 2½-inch openings, and a shaker screen with 2-inch holes. At the time no attempt was made to clean the coal after it came from the mine, as the conditions were favorable for loading clean coal. The average daily output of the mine was 3,700 tons, of which 80 per cent was pillar coal. The maximum day's run was 5,080 tons.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 165; Bureau of Mines Bull. 23, pp. 65, 170; briquetting tests: U. S. Geol. Survey Bull. 332, p. 166.

For chemical analyses of this coal see part I of this bulletin, p. 110; also U. S. Geol. Survey Bull. 332, p. 165.

LORD. TYSON NO. 7 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 8818, 8819, 8820, 8930 (p. 110).

Mine.—Tyson No. 7; a slope mine, ½ mile west of Lord, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Known in this field as the Tyson. Carboniferous age, Monongahela formation. At this mine it has an average thickness of 3 feet. The roof is a gray shale in one part of the mine and sandstone in the other. The roof is considered good, but is "slippy" in places. The floor is a hard gray underclay, to which the coal sticks.

The bed was measured and sampled at three points by J. J. Rutledge on August 16, 1909, as described below:

Section A (sample 8820) was cut from the face of the coal in right heading 1. It included 3 feet 3 inches of coal.

Section B (sample 8818) was cut from the face of coal in room No. 4, off left heading 1. It included 3 feet 4 inches of coal.

Section C (sample 8819) was cut from the face of coal in right heading 3. It included 3 feet of coal.

A composite sample was made by mixing the face samples 8818, 8819, and 8820 for an ultimate analysis, the results of which are shown under laboratory number 8930.

Notes.—In 1909 the coal at this mine was undercut by hand and shot down with black powder. The tipple was provided with bar screens with ¾-inch and 1½-inch spaces. Four sizes of coal, lump, nut, slack, and run-of-mine, were loaded. The mine at time of sampling had a capacity of 100 tons and an actual average output of 50 tons. The tonnage of the mine was to be gradually increased; all coal in the near future was to be derived from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 111.

Midland. Ocean No. 8 Mine.

Sample.—Bituminous coal; Georges Creek field; analyses Nos. 6355, 6360, 6366, 8778 (p. 112).

Mine.—Ocean No. 8; a drift mine at Midland, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Pittsburgh, known in this field as the Big Vein. The Upper Sewickley or Tyson bed has also been worked. Carboniferous age. Monongahela series. The Pittsburgh bed varies in thickness from 8 to 11 feet and has a shale roof 6 feet in thickness, above which is a cap rock. The floor is a hard underclay with smooth surface.

The Big Vein bed was measured and sampled by J. J. Rutledge on August 14, 1909, as described below:

Section of Big Vein coal bed in Ocean No. 8 mine at Midland.

Laboratory No.	8778	
	Ft.	*in.*
Roof, shale.		
Bone coal	1	5
Coal	3	8
Coal (soft mining)	0	7½
Coal	0	11½
Shale ("upper slate")[a]	0	¾
Coal	0	4¼
Shale ("lower slate")[a]	0	1¼
Coal	0	11¼
Shale ("penny slate")[a]	0	¼
Coal	1	½
Floor, hard underclay.		
Thickness of bed	9	2¼
Thickness of coal sampled	9	0

[a] Not included in sample.

The sample was cut from the split between rooms Nos. 19 and 20, off Cullen's heading.

The Upper Sewickley or Tyson bed was measured and sampled at three points by K. M. Way on August 5, 1908, as described below:

Sections of Upper Sewickley or Tyson coal bed in Ocean No. 8 mine at Midland.

Laboratory No.	6366		6355		6360	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale and sandstone.						
Coal	0	11½	..	..	0	10
Sulphur	..	..	0	⅛	..	..
Shale	0	⅛	..	..	0	⅛
Coal	1	¼	0	6½	0	9¼
Shale and sulphur	0	¼	..	..	0	⅛
Shale	..	..	0	⅛	..	..
Coal	0	5	0	8¼	0	5
Bone	0	¼	..	..	..	..
Shale	..	..	0	¼	0	¼
Coal	0	4¼	0	2¾	0	4¾
Shale	..	..	0	⅛	0	¼
Coal	..	..	1	1¾	0	2¾
Floor, shale.						
Thickness of bed	2	9⅝	2	7⅞	2	8½
Thickness of coal sampled	2	9⅝	2	7⅞	2	8½

Sample 6366 was taken 1,000 feet northeast of opening in room 7 on right heading 4.

Sample 6355 was taken 1,300 feet northwest of opening in breakthrough in main heading.

Sample 6360 was taken 500 feet northeast of opening in room 9 on right heading 2.

Notes.—In 1908 the mine had a squeeze so that no powder was necessary in order to obtain the coal. At time of sampling the coal was loaded in run-of-mine form, there being no screens at the mine. The mine was opened to obtain some coal that was lost by a squeeze in Ocean No. 1 mine. The output, which was all derived from pillars at time of sampling, averaged 100 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 112.

MIDLAND. TYSON NO. 8 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 8833, 8862, 8931 (p. 112).

Mine.—Tyson No. 8; a drift mine ½ mile from Midland, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Known in this field as the Tyson. Carboniferous age, Monongahela formation. The coal, which averages 3 feet in thickness, has a hard shale roof in a part of mine and sandstone in other parts. The floor is a hard underclay. In places the coal sticks more or less to both the roof and the floor.

The bed was measured and sampled at two points by J. J. Rutledge on August 14, 1909, as described below:

Sections of coal bed in Tyson No. 8 mine, ½ mile from Midland.

Section	A		B	
Laboratory No.	8862		8833	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	4	2	1
Shale (dark)[a]	0	¼	0	⅛
Coal	0	3¼	0	4
Floor, hard underclay.				
Thickness of bed	2	7½	2	5⅛
Thickness of coal sampled	2	7¼	2	5

[a] Not included in sample.

Section A (sample 8862) was cut from the face of bore hole heading off drift No. 2.

Section B (sample 8833) was cut from the face of room No. 1 on left entry 7, off drift No. 1.

A composite sample was made by mixing the face samples 8833 and 8862 for an ultimate analysis, the results of which are shown under laboratory number 8931.

Notes.—In 1909 the coal at this mine was cut with hand picks in the top part of the bed and shot down with black powder. The coal was loaded entirely as run-of-mine. One man picked the coal as it was loaded on the cars. Some pieces of the roof and floor got mixed with the coal in mining. The mine at time of sampling had a capacity of 150 tons, with an average output of 100 tons. It was stated that the immediate future output would be entirely from advance work and would be gradually increased to 500 tons within two years.

For chemical analyses of this coal see part I of this bulletin, p. 112.

MIDLAND. OCEAN NO. 1 MINE.

Sample.—Semibituminous coal; Georges Creek field; analyses Nos. 8763, 8764, 8765, 8766, 8767, 8768, 8835, 8836 (pp. 112, 113).

Mine.—Ocean No. 1; a slope mine 1 mile from Midland, 3 miles southwest of Frostburg, on the Cumberland & Pennsylvania and the Baltimore & Ohio Railroads.

Coal bed.—Known in this field as the Big Vein. Carboniferous age, Monongahela formation. The coal at this mine varies in thickness from 7½ to 9½ feet. It has a coal roof from 1 to 2 feet thick, which falls in some of the rooms. There is a cap rock about 6 feet above the coal. The floor is a hard underclay with smooth surface, and was not mixed with the coal in loading.

The bed was measured and sampled at six points by C. A. Fisher on August 7 and 9, 1909, as described below:

Sections of coal bed in Ocean No. 1 mine, 1 mile from Midland.

Section	A		B		C		D		E		F	
Laboratory No	8768		8767		8766		8764		8765		8763	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (hard)	1	1	1	0	1	1	0	10	1	0	0	8
Coal (soft)	5	9	4	10	4	4	4	11	4	2	3	10
Shale (dark soft) [a]	0	1	..	..	..	..	..	..	..	..	..	..
Coal ("mining")	..	..	0	4	0	4	0	3	0	5	0	3
Coal (bright)	0	3	0	10	0	10	0	10	0	9	0	11
Shale [a]	0	1½	..	..	0	½	0	1	0	1	0	1
Coal	2	0	..	..	0	5½	0	5	0	4½	0	5½
Shale (black hard) [a]	..	..	0	½	0	1	0	1	0	1½	0	1½
Coal	..	..	0	3	2	½	2	1	1	0	1	0
Bony coal [a]	..	..	..	..	..	..	..	..	..	..	0	½
Shale [a]	..	..	0	1½	..	..	..	..	0	½	..	..
Coal	..	..	2	1	..	..	..	..	1	0	1	0
Floor, shale.												
Thickness of bed	9	3½	9	6	9	2½	9	6	8	11½	8	4½
Thickness of coal	9	1	9	4	9	1	9	4	8	8½	8	1½

[a] Not included in sample.

Section A (sample 8768) was cut from right entry 3, off slope, room 7.

Section B (sample 8767) was cut from right entry 11, off slope, room 15.

Section C (sample 8766) was cut from right entry 10, off Welsh straight heading, room 13.

Section D (sample 8764) was cut from the right side of room 32, off Welsh's heading.

Section E (sample 8765) was cut from face of the lower dip heading.

Section F (sample 8763) was cut from rock heading, room 34.

Composite samples were made by mixing the face samples 8765, 8766, 8767, and 8768, and the pillar samples 8763 and 8764 for ultimate analyses, the results of which are shown under laboratory numbers 8835 and 8836, respectively.

Notes.—In 1909, the coal at this mine was undercut by hand and puncher machine at the bottom of the bed and shot down with black powder. The total tonnage was shipped as run-of-mine, the plant not being equipped with screens. The coal was picked on the car by two trimmers. The daily output of the mine in August, 1909, averaged 1,600 tons, and 2,000 tons was a maximum day's run. Approximately 785 acres of unmined coal was to be taken out from the opening, and the probable lifetime of the mine was considered 25 years. The output was to be increased to 2,500 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 112, 113.

GARRETT COUNTY.

WESTERNPORT. WASHINGTON NO. 3 MINE.

Sample.—Semibituminous coal; Georges Creek field; (Maryland No. 1) analyses Nos. 2018, 2019 (p. 113).

Mine.—Washington No. 3; a drift mine 2 miles north of Westernport, on the Cumberland & Pennsylvania Railroad.

Coal bed.—Locally called the 6-foot bed. Carboniferous age, Allegheny formation. Thickness, about 5 feet 4 inches; dip, nearly flat; roof, hard gray shale, called soapstone; floor, hard gray shale. The bed carries a shale parting 1 or 2 inches thick about 2 feet from the bottom, and a 6-inch layer of bone coal about 18 inches above that.

The bed was measured and sampled at two points by J. W. Groves on August 19, 1905, as described below:

Sections of coal bed in Washington No. 3 mine, 2 miles north of Westernport.

Section	A		B	
Laboratory No	2018		2019	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9½	1	2½
Bony coal [a]	0	7¼	..	..
Bone [a]	..	..	0	7½
Coal	1	7¼	1	4¼
Shale [a]	0	2	0	1½
Coal	2	2	2	2
Floor, shale.				
Thickness of bed	5	4	5	5¾
Thickness of coal sampled	4	6¾	4	8¾

[a] Not included in sample.

Section A (sample 2018) was measured in room 2 on right entry 6, 1,600 feet west of drift mouth.

Section B (sample 2019) was measured in room 3, on left entry 8, 1,700 feet southwest of drift mouth.

Notes.—The coal from this mine, like that from some others in this field, is brittle and friable. The rated capacity of the mine in 1905 was 500 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 132; Bureau of Mines Bull. 23, pp. 65, 169, 170; washing tests: U. S. Geol. Survey Bull. 290, p. 133; coking tests: U. S. Geol. Survey Bull. 290, p. 133; Bull. 336, pp. 23, 30, 39; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 53, 56, 59, 62.

For chemical analyses, see part I of this bulletin, p. 113; U. S. Geol. Survey Bull. 290, p. 131.

MICHIGAN.

SAGINAW COUNTY.

Saginaw. Barnard Mine.

Sample.—Bituminous coal; Michigan field; (Ann Arbor No. 9) analyses Nos. 7705, 7706 (p. 113).

Mine.—Barnard; Saginaw district; in the city city limits of Saginaw.

Coal bed.—Saginaw. Carboniferous age, Pottsville (?) group. Thickness of bed, 2 feet 10 inches to 3 feet 4 inches, free from partings.

The bed was measured and sampled at two points by Perry Barker.

Sample 7705 was taken in room 15, off northeast entry, 4,000 feet east of shaft, and was from a 2-foot 10-inch cut, the upper 6 inches of which was head coal.

Sample 7706 was taken in southeast entry, 4,000 feet east of shaft, and represented a 3-foot 4-inch cut, the upper 4 inches of which was head coal.

Note.—The head coal was of a dull luster, differing in appearance from that in the main bed.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 36, 47.

For chemical analyses, see part I of this bulletin, p. 113.

SAGINAW. RIVERSIDE MINE.

Sample.—Bituminous coal; Michigan field; analysis No. 5282 (p 113).

Mine.—Riverside; Saginaw district; in sec. 4, T. 10 N., R. 3 E., one-half mile southwest of Saginaw.

Coal bed.—Saginaw. Carboniferous age, Pottsville (?) formation.

The bed was measured and sampled by A. J. Hazlewood. The sample represented 3 feet 1 inch of coal.

For chemical analyses of this coal, see part I of this bulletin, p. 113.

ST. CHARLES. GAGE NO. 1 MINE.

Sample.—Bituminous coal; Michigan field; analysis No. 5286 (p. 113).

Mine.—Gage No. 1; Saginaw district; in sec. 5, T. 10 N., R. 3 E., at St. Charles.

Coal bed.—Saginaw. Carboniferous age, Pottsville (?) formation.

The bed was measured and sampled by A. J. Hazlewood. The sample represented 3 feet 7 inches of coal. It was taken from east entry 5, on north entry 4, south side.

For chemical analyses of this coal, see part I of this bulletin, p. 113.

MISSOURI.

ADAIR COUNTY.

KIRKSVILLE. ROCKY FORD NO. 1 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10101, 10102, 10106 (p. 114).

Mine.—Rocky Ford No. 1; a shaft mine in the Kirksville district, Benton township, near Kirksville, on the Wabash Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series. Roof, sandstone; floor, fire clay, underlain with white shale. The bed is 3 feet 11½ inches thick at points of sampling and lies flat. The cover for the most part is 168 feet thick.

The bed was measured and sampled on May 17, 1910, by J. M. Webb, as described below:

Sections of bed in Rocky Ford No. 1 mine, near Kirksville.

Laboratory No.	10101, 10102	
Roof, sandstone.	*Ft.*	*in.*
Sulphur [a]	0	2
Coal	3	3
Dirt band [a]	0	½
Coal	0	6
Floor, fire clay.		
Thickness of bed	3	11½
Thickness of coal sampled	3	9

[a] Not included in sample.

Sample 10101 was taken 300 feet northwest of the shaft in room 3, off north entry 1.

Sample 10102 was taken 300 feet northeast of shaft.

The samples were dry when taken.

A composite sample was made by mixing samples 10101 and 10102. The results of an ultimate analysis of this sample are shown under laboratory number 10106.

Note.—The daily capacity of the mine at the time of sampling was 50 tons.

For chemical analyses of this coal see part I of this bulletin, p. 114.

KIRKSVILLE. STAR NO. 1 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10099, 10100, 10442 (p. 114).

Mine.—Star No. 1, in the Kirksville district, ½ mile from Kirksville, on the Wabash Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. The bed is about 2 feet thick. The roof is sandstone and the floor is fire clay.

The bed was measured and sampled by J. M. Webb at two points, on March 17, 1910, as described below:

Sections of coal bed in Star No. 1 mine, one-half mile from Kirksville.

Laboratory No	10099, 10100
Roof, sandstone.	*Ft. in.*
Coal	0 8
Clay band [a]	0 1
Coal	1 4
Floor, fire clay.	
Thickness of bed	2 1
Thickness of coal sampled	2 0

[a] Not included in sample.

Sample 10099 was taken in the main entry, 250 feet east of the main shaft.

Sample 10100 was taken 350 feet northwest of bottom of shaft.

The samples were dry when taken.

A composite sample was made by mixing the face samples 10099 and 10100. The results of an ultimate analysis of this sample are shown under laboratory number 10442.

Note.—The daily capacity of the mine at the time of sampling was 50 tons.

For chemical analyses of this coal see part I of this bulletin, p. 114.

MORROW TOWNSHIP. NO. 1 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10077, 10079, 10080, 10081 (pp. 114).

Mine.—No. 1; in the Stahl district, Morrow Township, ¼ mile from Stahl, on the Quincy, Omaha & Kansas City Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Des Moines group. The roof is locally blue clay, 30 feet thick; the floor is soft underclay, 3½ feet thick. The bed is from 3½ feet to 3¾ feet thick at the points sampled.

The bed was measured and sampled at three points by J. M. Webb, on March 14, 1910, as indicated below:

Sections of coal bed in No. 1 mine, one-fourth mile from Stahl.

Laboratory No	10080	10079	10077
Roof, blue clay.	*Ft. in.*	*Ft. in.*	*Ft. in.*
Coal	1 4	1 4	1 4
White bony substance [a]	0 3	0 3	0 3
Coal	1 8	1 3	1 8
Black sulphur [a]	0 6	0 6	0 6
Floor.			
Thickness of bed	3 9	3 4	3 9
Thickness of coal sampled	3 0	2 7	3 0

[a] Not included in sample.

Sample 10077 was taken 2,000 feet northeast of the drift mouth.

Sample 10079 was taken 2,000 feet north of the drift mouth.

Sample 10080 was taken 2,100 feet northwest of the drift mouth.

The samples were dry when taken.

A composite sample was made by mixing samples 10077, 10079, and 10080. The results of an ultimate analysis of this sample are shown under laboratory number 10081.

Note.—The daily capacity of the mine at the time of sampling was 200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 114.

NINEVEH TOWNSHIP. NO. 1 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10085, 10086, 10087, 10088 (pp. 114–115).

Mine.—No. 1; in the Connelsville district, Nineveh township, 1½ miles south of Connelsville, on the Iowa & St. Louis Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is blue shale, 4 feet thick; the floor consists of 3 feet 6 inches of soft clay. The bed at this mine is about 4 feet thick, with two partings. The cover, for the most part, is 105 feet thick.

The bed was measured and sampled at three points by J. M. Webb, on March 15, 1910, as described below:

Sections of coal bed in No. 1 mine, 1½ miles south of Connelsville.

Laboratory No	10085		10086		10087	
Roof, blue shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	0	1	0
Clay [a]	0	1	0	1	0	½
Coal	0	4	0	8	0	10
Clay [a]	0	½	..	..	0	½
Sulphur [a]	..	..	0	2	..	..
Coal	2	6	2	2	2	3
Floor, soft clay.						
Thickness of bed	3	11½	4	1	4	2
Thickness of coal sampled	3	10	3	10	4	1

[a] Not included in sample

Sample 10085 was taken 2,500 feet west of the drift mouth.

Sample 10086 was taken 1,050 feet south of the drift mouth.

Sample 10087 was taken 1,800 feet north of the drift mouth.

The samples were dry when taken.

A composite sample was made by mixing samples 10085, 10086, and 10087. The results of an ultimate analysis of this sample are shown under laboratory number 10088.

For chemical analyses of this coal see part I of this bulletin, p. 114.

NOVINGER. ROMBAUER NO. 2 MINE.

Sample.—Bituminous coal; Novinger field; (Missouri No. 7) analyses Nos. 2823, 2824 (p. 115).

Mine.—Rombauer No. 2; a shaft mine, ½ mile northwest of Novinger, on the Quincy, Omaha & Kansas City Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. The thickness is fairly uniform, averaging 3 feet 6 inches. Dip slight, to the southwest. The roof is a hard black sandy shale carrying streaks of coal and is locally known as "bat"; this shale is about 2 feet thick. The floor is a soft fire clay that is not good to shovel from, flakes of it coming up with the coal. The cover is about 85 feet thick.

The bed was measured and sampled at two points by J. W. Groves and W. J. Von Borries on November 6, 1905, as described below:

Sections of coal bed in Rombauer No. 2 mine, one-half mile northwest of Novinger.

Section	A		B	
Laboratory No	2823		2824	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	11	1	7
Sulphur [a]	0	¼	0	½
Coal	0	3	0	3½
Shale [a]	0	1¼	0	1
Coal	0	4	1	0
Mother coal and sulphur [a]	0	1	..	..
Coal	0	7	..	..
Floor, fire clay.				
Thickness of coal bed	3	3½	3	0
Thickness of coal sampled	3	1	2	10

[a] Not included in sample.

Section A (sample 2823) was measured in room 13 off eighth east entry north, 1,700 feet northeast of the shaft.

Section B (sample 2824) was measured in third east entry south, 1,750 feet southeast of the shaft.

Note.—The coal from this mine, like that from some other mines working the same bed in this district, is rather hard.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 171; Bureau of Mines Bull. 23, pp. 65, 171; washing tests: U. S. Geol. Survey Bull. 332, p. 172; Bull. 336, p. 14.

For chemical analyses see part I of this bulletin, p. 115; also U. S. Geol. Survey Bull. 332, p. 171.

NOVINGER. ROMBAUER NO. 3 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10078, 10082, 10083, 10089 (p. 115).

Mine.—Rombauer No. 3; in the Novinger district, 2½ miles north of Novinger, on the Quincy, Omaha & Kansas City and the Iowa & St. Louis Railroads.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale, which is underlain in places with about 2 inches of sulphur. The floor is a soft underclay. At the points sampled the bed is from 3 feet 11 inches to 4 feet 2½ inches thick, with several partings. It lies flat. Cover, for the most part, 137 feet thick.

The bed was measured and sampled at three points by V. H. Hughes on March 11, 1910, as described below:

Sections of coal bed in Rombauer No. 3 mine, 2½ miles north of Novinger.

Laboratory No	10078		10082		10083	
Roof, black slaty shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	..	..	..	..
Sulphur[a]	..	..	0	1	..	..
Mother coal[a]	0	1	..	..	..	..
Coal	1	7	2	5	2	9
Shale[a]	0	½	0	10	0	½
Coal	0	4½	0	9½	..	..
Shale[a]	0	1	..	..	0	1
Coal	1	1	..	..	1	0
Floor, underclay (soft).						
Thickness of bed	3	11	4	1½	3	10½
Thickness of coal sampled	3	8½	3	2½	3	9

[a] Not included in sample.

Sample 10083 was taken in the west face, 1,300 feet west of shaft.

Sample 10082 was taken in the north face, 1,800 feet north of shaft.

Sample 10078 was taken in the north face, 1,800 feet from shaft.

The samples were dry when taken.

A composite sample was made by mixing the face samples 10078, 10082, and 10083. The results of an ultimate analysis of this sample are shown under laboratory No. 10089.

Note.—The daily capacity of the mine at the time of sampling was 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 115.

NOVINGER. GREAT NORTHERN NO. 21 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10075, 10076, 10084, 10090 (p. 115).

Mine.—Great Northern No. 21; Novinger district; 2½ miles southwest of Novinger, in sec. 6, T. 62 N., R. 16 W., on the Quincy, Omaha & Kansas City Railroad and the Iowa Central Railway.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. Roof, black shale overlain partly with sandstone; floor, soft underclay. The bed is 3 feet 9 inches to 3 feet 10 inches thick at the points sampled and has two partings. It lies flat.

The bed was measured and sampled at three points by V. H. Hughes on March 10, 1910, as described below:

Sections of coal bed in Great Northern No. 21 mine, 2½ miles southwest of Novinger.

Laboratory No	10075		10076		10084	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	8	1	1½	2	½
Slate[a]	0	1¼	..	..	..	..
Sulphur band[a]	..	..	..	½	..	..
Mother coal[a]	..	..	..	....	0	1
Coal	0	3	1	7	0	7½
Sulphur band[a]	..	½	..	..	..	..
Slate[a]	..	..	0	1¼	0	1
Coal	0	11	1	0	1	0
Floor, soft underclay.						
Thickness of bed	3	11¾	3	10¼	3	10
Thickness of coal sampled	3	10	3	8½	3	8

[a] Not included in sample.

Sample 10075 was taken in the west face, 1,200 feet from the shaft.

Sample 10076 was taken 800 feet east and 200 feet north of the shaft.

Sample 10084 was taken in the south face 1,500 feet from the shaft.

The samples were dry when taken.

A composite sample was made by mixing samples 10075, 10076, and 10084. The results of an ultimate analysis of this sample are shown under laboratory number 10090.

For chemical analyses of this coal see part I of this bulletin, p. 115.

AUDRAIN COUNTY.

VANDALIA. STANDARD MINE.

Sample.—Bituminous coal; Vandalia field; analyses Nos. 9982, 9983, 9984, 9993 (p. 116).

Mine.—Standard, on the western edge of the city of Vandalia; sec. 5, T. 52 N., R. 5 W.

Coal bed.—Mulky. Carboniferous age, Cherokee shale.

The bed was measured and sampled at three points in 1910 by V. H. Hughes, as shown below:

Sections of coal bed in Standard mine at Vandalia.

Laboratory No	9982		9983		9984	
Roof, "draw" slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	..	..	..	..	0	¾
Coal	1	5½	1	5½	1	5
Sulphur band[a]	0	½	0	¾	0	½
Coal	0	11	0	11	0	11
Floor, soft underclay.						
Thickness of bed	2	5	2	5¼	2	5¼
Thickness of coal sampled	2	4½	2	4½	2	4¾

[a] Not included in sample.

Sample 9982 was taken from the south wall, 1,000 feet from the opening.

Sample 9983 was taken from the west wall, 800 feet from the opening.

Sample 9984 was taken from the north face, 800 feet from the opening.

A composite sample was made by mixing samples 9982, 9983, and 9984. The results of an ultimate analysis of this sample are shown under laboratory number 9993.

For chemical analyses of this coal see part I of this bulletin, p. 116.

BATES COUNTY.

New Home. New Home No. 1 Mine.

Sample.—Bituminous coal; Rich Hill field; (Missouri No. 1) analyses Nos. 1041, 1043 (p. 116).

Mine.—New Home No. 1; a shaft mine at New Home, on a branch line of the St. Louis & San Francisco Railroad.

Coal bed.—The coal bed mined at New Home is a local deposit of small extent, containing approximately 600 acres of workable coal. It is generally supposed to be at the same horizon as the coal mined at Rich Hill, a few miles southeast. The New Home mine has a shaft 275 feet deep. The bed lies nearly horizontal, but near the foot of the shaft has a dip of 20° to 25° for about 200 feet. The roof is bad. The coal is very free from partings.

The bed was measured and sampled at two points in the mine by M. R. Campbell and J. S. Burrows, in 1904, as shown below:

Sections of coal bed in New Home No. 1 mine at New Home.

Section	A		B	
Laboratory No	1041		1043	
	Ft.	*in.*	*Ft.*	*in.*
Coal	3	1	3	8
Sulphur[a]	0	½	0	1
Coal	1	3	1	6
Thickness of bed	4	4½	5	3
Thickness of coal sampled	4	4	5	2

[a] Not included in sample.

Section A (sample 1041) was measured at the face of room 18 off east entry 1.

Section B (sample 1043) was measured at the bottom of the slope in east entry 1.

Notes.—At time of sampling the coal had been sold mostly for steam making, a considerable part of the output being taken by the St. Louis & San Francisco Railroad Co. The capacity was 250 to 300 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 681; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 65; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1445; Bull. 261, p. 160.

For chemical analyses see part I of this bulletin, p. 116; also U. S. Geol. Survey Prof. Paper 48, p. 235; Bull. 261, p. 48.

CALDWELL COUNTY.

Hamilton. Caldwell No. 1 Mine.

Sample.—Bituminous coal; Caldwell field; analyses Nos. 10166, 10167, 10168, 10172 (pp. 116, 117).

Mine.—Caldwell No. 1; near Caldwell, Gomer Township, on the Burlington Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, in the Cherokee shale. The roof is limestone underlain with 6 inches of blue "slate"; the floor is sandy shale. The bed is 1½ feet thick at the points of sampling. The cover for the most part is 470 feet thick.

The bed was measured and sampled at three points by J. M. Webb on March 24, 1910. Each sample represented 1 foot 6 inches of clear coal and was dry when taken.

Sample 10166 was taken in the southwest face, 1,200 feet from the hoisting shaft.

Sample 10167 was taken in the south face, 1,500 feet from the hoisting shaft.

Sample 10168 was taken in the south face, 1,300 feet from the hoisting shaft.

A composite sample was made by mixing samples 10166, 10167, and 10168. The results of an ultimate analysis of this sample are shown under laboratory number 10172.

Note.—The daily capacity of the mine at time of sampling was 75 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 116, 117.

CLAY COUNTY.

MISSOURI CITY. MISSOURI CITY NO. 1 MINE.

Sample.—Bituminous coal; Richmond field; analyses Nos. 10219, 10220, 10221, 10231 (p. 117).

Mine.—Missouri City No. 1; Missouri City district; at Missouri City, on the Wabash Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. Roof, white limestone overlain with blue limestone; floor, fire clay. The bed is about 1 foot 10 inches thick at the points sampled and lies flat. The cover for the most part is 165 feet thick.

The bed was measured and sampled at three points by J. M. Webb on April 4, 1910.

Sample 10219 was taken in the west face, 1,800 feet from the shaft.

Sample 10220 was taken in the west face, 1,800 feet from the shaft.

Sample 10221 was taken in the west face, 1,500 feet from the shaft.

The samples were moist when taken, and each represented 1 foot 10 inches of coal.

A composite sample was made by mixing the face samples 10219, 10220, 10221. The results of an ultimate analysis of this sample are shown under laboratory number 10231.

Note.—The daily capacity of the mine at time of sampling was 100 tons.

For chemical analyses of this coal see part I of this bulletin, p. 117.

GRUNDY COUNTY.

TRENTON. TRENTON NO. 3 MINE.

Sample.—Bituminous coal; Trenton field; analyses Nos. 10151, 10152, 10153, 10161 (p. 117).

Mine.—Trenton No. 3; Trenton district, in sec. 16, T. 61, R. 24, ½ mile south of Trenton, on the Chicago, Rock Island & Pacific and Quincy, Omaha & Kansas City Railroads.

Coal bed.—Tebo (?). Carboniferous age, Pennsylvanian series, Cherokee shale. Roof, black shale overlain with limestone, black shale, etc.; floor, fire clay. The bed is 1½ feet thick at the points sampled, and lies flat. The cover for most part is 175 feet thick.

The bed was measured and sampled by J. M. Webb at three points on March 19, 1910.

Sample 10151 was taken in north face, 500 feet from hoisting shaft.

Sample 10152 was taken in north face, 500 feet from hoisting shaft.

Sample 10153 was taken in west face, 500 feet from bottom of shaft.

The samples were dry when taken, and each represented 1 foot 6 inches of clear coal.

A composite sample was made by mixing the face samples 10151, 10152, and 10153. The results of an ultimate analysis of this sample are given under laboratory number 10161.

Note.—The daily capacity of the mine at time of sampling was 75 tons.

For chemical analyses of this coal see part I of this bulletin, p. 117.

HENRY COUNTY.

WINDSOR. BOWEN NO. 4 MINE.

Sample.—Bituminous coal; Windsor field; analyses Nos. 10349, 10350, 10351, 10355 (p. 117).

Mine.—Bowen No. 4: Windsor district; near Windsor, in T. 44 N., R. 24 W., on the Chicago, Rock Island & Pacific and the Missouri, Kansas & Texas Railways.

Coal bed.—Bowen. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is shale and the floor is bituminous shale. The bed is 5 feet thick, with a parting of clay or shale. The cover for the most part is 90 feet thick.

The bed was measured and sampled at three points by J. M. Webb on April 18, 1910, as described below:

Sections of coal bed in Bowen No. 4 mine near Windsor.

Laboratory No	10349		10350		10351	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10	1	10	1	6
Clay band [a]	0	2	0	1	..	..
Shale [a]	..	..	..	..	0	2
Coal	3	2	3	2	3	6
Floor, bituminous shale.						
Thickness of bed	5	2	5	1	5	2
Thickness of coal sampled	5	0	5	0	5	0

[a] Not included in sample.

Sample 10349 was taken in the west face, 800 feet from the shaft.

Sample 10350 was taken in the northwest face, 600 feet from the shaft.

Sample 10351 was taken in the east face, 800 feet from the shaft.

Samples 10349 and 10350 were dry when taken; sample 10351 was wet when taken.

A composite sample was made by mixing the face samples 10349, 10350, and 10351. The results of an ultimate analysis of this sample are shown under laboratory number 10355.

Note.—The daily capacity of the mine at time of sampling was 500 tons.

For chemical analyses of this coal see part I of this bulletin, p. 117.

JOHNSON COUNTY.

SUTHERLAND. NO. 1 MINE.

Sample.—Bituminous coal; Missouri field; analyses Nos. 10346, 10347, 10348, 10354 (p. 118).

Mine.—No. 1; Windsor district; at Sutherland, on the Missouri, Kansas & Texas Railway.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, in the Cherokee shale. The roof is hard clay shale and the floor is fire clay. The bed is about 1 foot 8 inches thick at the points of sampling, and lies flat. The cover for the most part is 180 feet thick.

The bed was measured and sampled at two points on April 16, 1910, by J. M. Webb.

Sample 10346 was taken in west face, 2,000 feet from shaft. and represented 1 foot 8 inches of clear coal.

Sample 10347 was taken in east face, 160 feet from shaft, and represented 1 foot 7 inches of clear coal.

Sample 10348 was taken in north face, 200 feet from shaft, and represented 1 foot 8 inches of coal.

The samples were moist when taken.

A composite sample, made from samples 10346, 10347, and 10348, was numbered 10354.

Note.—The daily capacity of the mine at time of sampling was 15 tons.

For chemical analyses of this coal see part I of this bulletin, p. 118.

LAFAYETTE COUNTY.

CORDER. BLACK DIAMOND MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10343, 10344, 10345, 10353 (p. 118).

Mine.—Black Diamond; Corder district; at Corder, Dover Township, on the Chicago & Alton Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with limestone. The floor is soft underclay. The bed is 1 foot 10 inches thick at points of sampling and lies flat. The cover for the most part is 30 to 50 feet thick.

The bed was measured and sampled by J. M. Webb on April 13, 1910, at three points.

Sample 10343 was taken in northwest face, 400 feet from the shaft.

Sample 10344 was taken in north face, 350 feet from the shaft.

Sample 10345 was taken in west face, 400 feet from the shaft.

Samples 10343 and 10344 were wet and sample 10345 was moist when taken.

Each sample represented 1 foot 10 inches of coal.

A composite sample was made by mixing the face samples 10343, 10344, and 10345. The results of an ultimate analysis of this sample are shown under laboratory number 10353.

Note.—The daily capacity of the mine at time of sampling was 25 tons.

For chemical analyses of this coal see part I of this bulletin, p. 118.

CORDER. WILSON MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10242, 10243, 10244, 10246 (p. 118).

Mine.—Wilson; Corder district; ¾ mile south of Corder, Dover Township, in T. 50, R. 25, on the Chicago & Alton Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with limestone; the floor is soft underclay. The bed is 1 foot 8 inches thick at points of sampling. The cover for the most part is 60 feet thick.

The bed was measured and sampled by J. M. Webb on April 12, 1910, at three points.

Sample 10242 was taken in east face, 650 feet from shaft.

Sample 10243 was taken in southeast face, 600 feet from shaft.

Sample 10244 was taken in south face, 600 feet from shaft.

The samples were moist when taken.

Each sample represented 1 foot 8 inches of coal.

A composite sample was made by mixing the face samples, 10242, 10243, and 10244. The results of an ultimate analysis for this sample are shown under laboratory No. 10246.

Note.—The daily capacity of the mine at time of sampling was 225 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 118, 119.

HIGGINSVILLE. NO. 1 MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10239, 10240, 10241, 10245 (p. 119).

Mine.—No. 1; in Higginsville district; ½ mile south of Higginsville, Dover Township, on the Missouri Pacific Railway.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with limestone; the floor is underclay with 4 to 6 inches of sulphur shale below. The bed is from 1⅓ to 1½ feet thick and without partings at points of sampling. The cover for the most part is 80 feet thick.

The bed was measured and sampled at three points by J. N. Webb on April 11, 1910.

Sample 10239 was taken in west face, 1,400 feet from hoisting shaft, and represented 1 foot 6 inches of coal.

Sample 10240 was taken in southwest face, 2,000 feet from hoisting shaft, and represented 1 foot 4 inches of coal.

Sample 10241 was taken in southeast face, 2,000 feet from shaft, and represented 1 foot 6 inches of coal.

The samples were moist when taken.

A composite sample was made by mixing the face samples 10239, 10240, and 10241. The results of an ultimate analysis of this sample are shown under laboratory No. 10245.

Note.—The daily capacity of the mine at time of sampling was 200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 119.

LEXINGTON. GRADDY MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10225, 10226, 10227, 10233 (p. 119).

Mine.—Graddy; Lexington district; at Lexington, on the Missouri Pacific Railway.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with limestone; the floor is soft underclay underlain with 2 inches of blue clay. The bed is from 1 foot 7 inches to 1 foot 8 inches thick at the points of sampling. The cover for the most part is 125 feet thick.

The bed was measured and sampled at three points by J. M. Webb on April 7, 1910.

Sample 10225 was taken at the face, 5,000 feet southwest of drift mouth and represented 1 foot 7 inches of coal.

Sample 10226 was taken at the face, 6,000 feet southeast of drift mouth and represented 1 foot 8 inches of coal.

Sample 10227 was taken at east face, 5,000 feet east of drift mouth and represented 1 foot 8 inches of coal.

Samples 10226 and 10227 were moist and sample 10225 was dry when taken.

A composite sample was made by mixing the face samples 10225, 10226, and 10227. The results of an ultimate analysis of this sample are shown under laboratory No. 10233.

Note.—The daily capacity of the mine at the time of sampling in 1910 was 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 119.

LEXINGTON. SUMMIT MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 1010, 1011 (p. 119).

Mine.—Summit; at Lexington.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale.

The bed was measured and sampled on August 17, 1904, by J. S. Burrows. The samples represented cuts of 20 to 22 inches across the full face of the coal bed.

For chemical analyses of this coal see part I of this bulletin, p. 119.

NAPOLEON. INDEPENDENCE MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10222, 18223, 10224, 10232 (p. 119).

Mine.—Independence; Higginsville district; 1 mile east of Napoleon, on the Missouri Pacific Railway.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is shale overlain with limestone; the floor is fire clay. The bed is 1½ feet thick at the points of sampling. The cover for the most part is 40 feet thick.

The bed was measured and sampled at three points by J. M. Webb on April 6, 1910.

Sample 10222 was taken in south face 1,400 feet from hoisting shaft.

Sample 10223 was taken in face 1,400 feet from shaft.

Sample 10224 was taken in face 1,200 feet from hoisting shaft.

Each sample represented 1 foot 6 inches of coal.

Samples 10223 and 10224 were moist when taken. Condition of sample 10222 not stated.

A composite sample was made by mixing the face samples 10222, 10223, and 10224. The results of an ultimate analysis of this sample are shown under laboratory number 10232.

Note.—The daily capacity of the mine at time of sampling was 50 tons.

For chemical analyses of this coal see part 1 of this bulletin, p. 119.

WAVERLY. BUCKHORN MINE.

Sample.—Bituminous coal; Waverly field; analyses Nos. 10340, 10341, 10342, 10352 (pp. 119, 120).

Mine.—Buckhorn; Waverly district; 1½ miles south of Waverly, Waverly Township, on the Missouri Pacific Railway.

Coal bed.—Waverly. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale; the floor is in part clay shale. The bed is 3 feet 11 inches to 4 feet 2 inches thick and lies flat. The cover for the most part is 150 feet thick.

The bed was measured and sampled in three places on April 14, 1910, by J. M. Webb, as described below:

Sections of coal bed in Buckhorn mine, 1½ miles south of Waverly.

Laboratory No.	10340		10341		10342	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	10	3	0	3	1
Clay [a]	0	1½	0	1	0	2
Coal	1	0	0	10	1	0
Floor, clay shale.						
Thickness of bed	3	11½	3	11	4	3
Thickness of coal sampled	3	10	3	10	4	1

[a] Not included in sample.

Sample 10340 was taken in the face of west entry 1, off the main south entry, 700 feet from the shaft.

Sample 10341 was taken in the face of east entry 2, off the main south entry, 600 feet from the shaft.

Sample 10342 was taken in the face of the main east entry, 1,000 feet from the shaft.

The samples were moist when taken.

A composite sample was made by mixing samples 10340, 10341, and 10342. The results of an ultimate analysis of this sample are shown under laboratory number 10352.

Note.—The daily capacity of the mine at time of sampling was 200 tons.

For chemical analyses of this coal see part 1 of this bulletin, p. 119.

WELLINGTON. LABOR EXCHANGE BRANCH NO. 305 MINE.

Sample.—Bituminous coal; Lexington field; analyses Nos. 10228, 10229, 10230, 10234 (p. 120).

Mine.—Labor Exchange Branch No. 305; Wellington district; 2½ miles west of Wellington, on the Missouri Pacific Railway.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with limestone; the floor is soft underclay. The bed is 1 foot 6 inches to 1 foot 8 inches thick at the points sampled and lies flat. The cover for the most part is 95 feet thick.

The bed was measured and sampled at three points by J. M. Webb on April 7, 1910.

Sample 10228 was taken in southwest face, 1,200 feet from shaft bottom, and represented 1 foot 7 inches of coal.

Sample 10229 was taken in south face, 1,100 feet from shaft, and represented 1 foot 8 inches of coal.

Sample 10230 was taken in southeast face, 1,500 feet from shaft, and represented 1 foot 6 inches of coal.

A composite sample was made by mixing samples 10228, 10229, and 10230. The results of an ultimate analysis of this sample are shown under laboratory number 10234.

Samples 10228 and 10230 were dry when taken, and sample 10229 was wet when taken.

For chemical analyses of this coal see part I of this bulletin, p. 120.

MACON COUNTY.

BEVIER. NO. 8 MINE.

Sample.—Bituminous coal; Bevier field; (Missouri No. 2) analyses Nos. 1226, 1227 (p. 120).

Mine.—No. 8; a shaft mine 1 mile south of Bevier, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—The bed worked in mine No. 8 is the Bevier coal (Carboniferous age, Pennsylvanian series, Cherokee shale), the most extensive of all the Missouri beds. It underlies Macon, Chariton, Randolph, and parts of adjoining counties, and varies in thickness from 4 to 6 feet. At the No. 8 mine the shaft is 135 feet deep.

Two sections of the bed were measured and sampled by J. W. Groves in 1904, as shown below:

Sections of coal bed in No. 8 mine, 1 mile south of Bevier.

Section	A		B	
Laboratory No.	1226		1227	
	Ft.	*in.*	*Ft.*	*in.*
Coal	3	5	4	5
Shale	0	1½	0	3
Coal	1	0	0	10
Thickness of coal bed	4	6½	5	6
Thickness of coal sampled	4	5	5	3

Section A (sample 1226) was measured in east entry 1, on the north side, and section B (sample 1227) was measured in west entry 2, on the south side.

Notes.—In 1904 the capacity of the mine was 1,000 tons daily, and the output averaged 850 tons daily. The coal was sold chiefly for making steam, the railroads taking the larger part. About 20 per cent was used for domestic use, and the remainder including the slack, was sold to manufacturing plants.

For results of tests of this coal see mention of specific tests, as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 705; Bull. 261, p. 81; Bureau of Mines Bull. 23, p. 65: producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1155; Bull. 261, p. 101; Bureau of Mines Bull. 13, pp. 140, 274; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1471; Bull. 261, p. 70; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1351; Bull. 261, p. 126.

For chemical analyses see part I of this bulletin, p. 120; also U. S. Geol. Survey Prof. Paper 48, p. 236; Bull 261, p. 48.

BEVIER. NO. 9 SHAFT.

Sample.—Bituminous coal; Bevier field; analyses Nos. 9988, 9989, 9990, 9991 (p. 121).

Mine.—No. 9 shaft; Bevier district; 1¼ miles southeast of Bevier, in sec. 23, T. 57 N., R. 15 W., on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale overlain with sandstone; the floor is soft underclay. The bed is from 3 feet ¼ inch to 4 feet 9 inches thick at points of sampling, with several partings. It lies flat. The cover for the most part is 105 feet thick.

The bed was measured and sampled at three points by V. H. Hughes on February 11, 1910, as described below:

Sections of coal bed in No. 9 shaft mine, 1¼ miles southeast of Bevier.

Laboratory No	9988		9989		9990	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3½	1	4½	1	9½
Sulphur [a]	0	1	..	..	..	..
Mother coal [a]	..	..	0	¼	..	..
Bone	..	..	..	..	0	¾
Coal	1	1	0	6	1	7¾
Coal, bony [a]	0	¾	..	..	..	..
Clay [a]	..	..	0	1	0	2
Coal	..	11	..	..	..	..
Clay [a]	0	1½	..	..	..	..
Coal	0	9½	1	1½	1	1
Floor, soft underclay.						
Thickness of bed	4	4¼	3	1¼	4	9
Thickness of coal sampled	4	1	3	0	4	7

[a] Not included in sample.

Sample 9988 was taken in east face, 2,200 feet from shaft.

Sample 9989 was taken in south face, 1,700 feet from shaft.

Sample 9990 was taken 1,300 feet north and 400 feet west of shaft.

The samples were dry when taken.

A composite sample was made by mixing the face samples 9988, 9989, and 9990. The results of an ultimate analysis of this sample are shown under laboratory number 9991.

Note.—The daily capacity of this mine at time of sampling was 300 tons.

For chemical analyses of this coal, see part I of this bulletin, p. 121.

BEVIER. CENTRAL NO. 61 MINE.

Sample.—Bituminous coal; Bevier field; (Missouri No. 10) analyses Nos. 4196, 4197 (p. 121).

Mine.—Central No. 61; a shaft mine, 2½ miles south of Bevier, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. Thickness, fairly uniform, averaging 4 feet 7 inches at this mine. Dip, slight. The roof is poor, a massive gray shale; floor, gray fire clay. Both roof and floor give trouble in loading mine cars. The cover for the most part is about 120 feet thick.

The bed was measured and sampled at two points by K. M. Way on November 20, 1906, as described on the following page:

Sections of coal bed in Central No. 61 mine, 2½ miles south of Bevier.

Section	A		B	
Laboratory No.	4196		4197	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	5½	1	9½
Mother coal	0	¼	..	..
Shale	..	..	0	¼
Coal	1	4	1	7
Shale	0	¼	0	⅜
Coal	0	3	0	3
Soft shale [a]	0	1¾	..	..
Shale	..	..	0	¼
Coal	0	11	1	4
Shale [a]	0	¼	..	..
Soft shale [a]	..	..	0	3
Coal	0	1	0	4½
Shale [a]	..	..	0	½
Coal	..	..	0	3
Floor, fire clay.				
Thickness of bed	4	3	5	11⅜
Thickness of coal sampled	4	1	5	7⅞

[a] Not included in sample.

Section A (sample 4196) was measured in room 7, off twelfth east entry, off second south entry, east side entry 2, 4,000 feet south of mouth of shaft.

Section B (sample 4197) was measured in first west entry, off second south entry, west side, 2,500 feet west of the bottom of shaft.

Note.—The approximate output of the mine in 1906 was 1,000 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 173; Bureau of Mines Bull. 23, p. 65, 171; briquetting tests: U. S. Geol. Survey Bull. 332, p. 173.

For chemical analyses see part I of this bulletin, p. 121; also U. S. Geol. Survey Bull. 332, p. 172.

BEVIER. NO. 61 MINE.

Sample.—Bituminous coal; Bevier field; analyses Nos. 10191, 10192, 10193, 10201 (p. 121).

Mine.—No. 61; Bevier district; in sec. 27, T. 57 N., R. 15 W., 2 miles from Bevier on the Burlington Railroad.

Coal bed.—Bevier. Carboniferous age, Pennsylvanian series, Cherokee shale. Roof, sandstone; floor, soft underclay. The bed is from 2½ to 3¾ feet thick at points sampled, with a clay parting. Cover for the most part 70 feet thick.

The bed was measured and sampled on March 28, 1910, by J. M. Webb, as described below. The samples were moist when taken.

Sections of coal bed in No. 61 mine, 2 miles from Bevier.

Laboratory No.	10191 10192 10193	
Roof, sandstone.	*Ft.*	*in.*
Coal	3	2
Clay [a]	0	1½
Coal	0	6
Floor, soft underclay.		
Thickness of bed	3	9½
Thickness of coal sampled	3	8

[a] Not included in sample.

Sample 10191 was taken in east main entry, 3,500 feet from shaft.

Sample 10192 was taken in east entry 10 at face of main north entry, 4,000 feet from shaft.

Sample 10193 was taken in face off main south entry, 4,500 feet from shaft.

A composite sample was made by mixing the face samples 10191, 10192, and 10193. The results of an ultimate analysis of this sample are shown under laboratory number 10201.

Note.—The daily capacity of the mine at time of sampling was 500 tons.

For chemical analyses of this coal see part I of this bulletin, p. 121.

MACON. HOME MINE.

Sample.—Bituminous coal; Bevier field; analyses Nos. 9985, 9986, 9992 (p. 121).

Mine.—Home; Macon City district, on the east side of Macon, in sec. 16, T. 57 N., R. 14 W., on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Mulky. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is black shale underlain with 6 to 8 inches of "draw slate," under which is ½ to 4 inches of sulphur and fossil band. The floor is soft underclay. The bed is about 2 feet thick at the points sampled.

The bed was measured and sampled at two points by V. H. Hughes on February 12, 1910.

Sample 9985 was taken in the west face, 80 feet from shaft, and represented 1 foot 11 inches of coal.

Sample 9986 was taken in east face, 80 feet from shaft, and represented 2 feet ½ inch of coal.

The samples were dry when taken.

A composite sample was made by mixing the face samples 9985 and 9986. The results of an ultimate analysis of this sample are shown under laboratory number 9992.

Note.—The coal in this mine is used chiefly for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 121.

MILLER COUNTY.

BARNETT. COUNTRY BANK.

Sample.—Bituminous coal; Missouri field; (Missouri No. 4) analyses Nos. 1446, 1447 (p. 121).

Location.—At the time the samples were taken the opening was merely a country bank without railroad connections. It is located 6 miles northeast of Barnett (Morgan County), or about 11 miles southeast of Versailles, in sec. 6, T. 42 N., R. 15 W.

Coal bed.—This mine works one of the pockets of coal that are common in the central part of the State. They are of Carboniferous age. Pennsylvanian series.

The thickness of coal in this pocket had not been determined but was variously reported as 40 to 64 feet. The coal exposed was 14 feet thick, but the floor and roof were both in coal. It is probable that the pocket is of small extent, covering only a few acres. It was to be mined by steam shovel. The coal contains considerable "sulphur" and also veins of zinc ore.

Two samples from the left side of the pit were taken by J. W. Groves, in 1904.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests, U. S. Geol. Survey Prof. Paper 48, p. 737; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 65.

For chemical analyses see part I of this bulletin, p. 121; also U. S. Geol. Survey Prof. Paper 48, p. 238; Bull. 261, p. 49.

RANDOLPH COUNTY.

HIGBEE. NO. 7 MINE.

Sample.—Bituminous coal; Bevier field; (Missouri No. 5) analyses Nos. 2795, 2796 (p. 122).

Mine.—No. 7; a shaft mine at Higbee, on the Chicago & Alton Railroad.

Coal bed.—Bevier bed, Carboniferous age, Pennsylvanian series, Cherokee shale. Thickness, fairly uniform, averaging at this mine 3 feet 10 inches. The bed lies nearly flat, the greatest dip being 1.5 per cent north. Roof, massive gray shale, which does not stand well; floor, fire clay. The bed has local streaks of pyrite and one persistent parting. The coal is worked at a depth of 170 feet.

The bed was measured and sampled at two points by J. W. Groves and W. J. Von Borries, on January 22, 1906, as described below:

Sections of coal bed in No. 7 mine, at Higbee.

Section	A		B	
Laboratory No	2795		2796	
	Ft	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	1	1	7
Sulphur[a]	0	1	..	..
Shale and coal	..	..	0	½
Coal	0	7	1	2
Shale[a]	0	3½	0	5
Coal	0	10	0	8
Floor, fire clay.				
Thickness of bed	3	10½	3	10½
Thickness of coal sampled	3	6	3	5½

[a] Not included in sample.

Section A (sample 2795) was measured in west entry 3, 3,400 feet N. 15° W. of the shaft.

Section B (sample 2796) was measured in the north entry, 5,000 north of the shaft.

Note.—The approximate output of the mine in 1906 was 400 tons per day.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests, U. S. Geol. Survey Bull. 332, p. 167; Bureau of Mines Bull. 23, pp. 65, 170; washing tests, U. S. Geol. Survey Bull. 332, p. 168; Bull. 336, p. 14; coking tests, U. S. Geol. Survey Bull. 332, p. 168; Bull. 336, pp. 23, 30, 39; cupola tests of coke, U. S. Geol. Survey Bull. 336, pp. 66, 69, 70, 72, 74; Bull. 332, p. 168.

For chemical analyses see part I of this bulletin, p. 122, also U. S. Geol. Survey Bull. 332, p. 167.

HUNTSVILLE. NO. 3 MINE.

Sample.—Bituminous coal, Bevier field; (Missouri No. 6) analyses Nos. 2817, 2818 (p. 122).

Mine.—No. 3; located in the Huntsville district; a shaft mine, 1 mile east of Huntsville.

Coal bed.—Bevier bed, which is worked at Higbee. It is of Carboniferous age, Pennsylvanian series, Cherokee shale. The average thickness at this mine is about 3 feet 8 inches; dip, very slight, about 7 feet to the mile south; roof, sandy shale; floor, fire clay. The cover for the most part is about 75 feet thick.

The bed was measured and sampled at two points by J. W. Groves and W. J. Von Borries on January 23, 1906, as described below:

Sections of coal bed in No. 3 mine, 1 mile east of Huntsville.

Section	A		B	
Laboratory No	2817		2818	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	3	0	0	4½
Shale[a]	0	4	..	..
Mother coal	..	..	0	½
Coal	0	8	2	0
Sulphur	..	..	0	⅛
Coal	..	..	0	3
Shale[a]	..	..	0	4
Coal	..	..	0	5
Floor, fire clay.				
Thickness of bed	4	0	3	5⅛
Thickness of coal sampled	3	8	3	1⅛

[a] Not included in sample.

Section A (sample 2817) was measured in room 1, off north (?) entry 2,900 feet north of shaft.

Section B (sample 2818) was measured in room 3, off west entry 6, 4,000 feet southwest of shaft.

Note.—The approximate output of the mine in the winter of 1906 was 300 tons per day.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests, U. S. Geol. Survey Bull. 332, p. 170; Bureau of Mines Bull. 23, pp. 65, 170; washing tests, U. S. Geol. Survey Bull. 336, p. 14.

For chemical analyses, see part I of this bulletin, p. 122; also U. S. Geol. Survey Bull. 332, p. 169.

RYDER. JONES NO. 1 MINE.

Sample.—Bituminous coal; Bevier field; analyses Nos. 10180, 10181, 10182, 10183 (p. 123).

Mine.—Jones No. 1; Higbee district, 4 miles east of Higbee, at Ryder (Prairie Township), in sec. 14, T. 52 N., R. 14 W., near the Chicago & Alton Railroad.

Coal bed.—Bevier coal. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is limestone and shale; the floor is fire clay. The bed is 3 feet 7½ inches thick, with a clay band parting at the points sampled. The bed does not dip. The cover for the most part is 69 feet thick.

The bed was measured and sampled by J. M. Webb on March 27, 1910, at three points, as described below:

Sections of coal bed in Jones No. 1 mine at Ryder.

Laboratory No.	10180 10181 10182
Roof, sandstone.	*Ft. in.*
Coal	2 11
Clay band [a]	0 1½
Coal	0 7
Floor, fire clay.	
Thickness of bed	3 7½
Thickness of coal sampled	3 6

[a] Not included in sample.

Sample 10180 was taken in southwest face, 75 feet from hoisting shaft.

Sample 10181 was taken in southwest main entry at face, 75 feet southwest of shaft bottom.

Sample 10182 was taken in southwest face, 60 feet from bottom of shaft.

The samples were moist when taken.

A composite sample was made by mixing the face samples 10180, 10181, and 10182. The results of an ultimate analysis of this sample are shown under laboratory number 10183.

Note.—The daily output at time of sampling was 5 tons.

For chemical analyses of this coal see part I of this bulletin, p. 123.

RAY COUNTY.

CAMDEN. NO. 2 MINE.

Sample.—Bituminous coal; Richmond field; analyses Nos. 10206, 10207, 10208, 10217 (p. 123).

Mine.—No. 2; Richmond district; at Camden, Camden Township, on the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is "slate" overlain with limestone. The floor is clay. The bed is 1 foot 8 inches thick, with a parting of "blue dirt," at the points sampled. The cover for the most part is 75 feet thick.

The bed was measured and was sampled at three points by J. M. Webb on April 2, 1910, as described below:

Section of coal bed in No. 2 mine at Camden.

Laboratory No.	10205 10207 10208	
Roof, slaty shale.	*Ft.*	*in.*
Coal	1	3
Soft blue dirt[a]	0	½
Coal	0	4½
Floor, clay.		
Thickness of bed	1	8
Thickness of coal sampled	1	7½

[a] Not included in sample.

Sample 10206 was taken in west face, 1,000 feet from the shaft.

Sample 10207 was taken in west face, 900 feet from the shaft.

Sample 10208 was taken in west face, 1,200 feet from the shaft.

The samples were moist when taken.

A composite sample was made by mixing the face samples 10206, 10207, and 10208. The results of an ultimate analysis of this sample are shown under laboratory number 10217.

Note.—The daily capacity at the time of sampling was 50 tons.

For chemical analyses of this coal see part I of this bulletin, p. 123.

RICHMOND. NO. 50 MINE.

Sample.—Bituminous coal; Richmond field; analyses Nos. 10194, 10195, 10196, 10200 (p. 123).

Mine.—No. 50; Richmond district; in sec. 23, T. 52 N., R. 27 W., ½ mile from Richmond, Richmond Township, on a branch of the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Des Moines group. The roof is slaty shale overlain with limestone. The floor is soft underclay. The bed is 2½ feet thick, with a shale parting at the points of sampling. It lies flat. The cover for the most part is 70 feet thick.

The bed was measured and sampled on March 30, 1910, by J. M. Webb at three points, as described below:

Sections of coal bed in No. 50 mine, ½ mile from Richmond.

Laboratory No.	10194 10195 10196	
Roof, slaty shale.	*Ft.*	*in.*
Coal	0	8
Blue shale, sandy[a]	0	2
Coal	1	8
Floor, soft underclay.		
Thickness of bed	2	6
Thickness of coal sampled	2	4

[a] Not included in sample.

Sample 10194 was taken in north face, 100 feet from shaft.

Sample 10195 was taken in north face, 100 feet from shaft.

Sample 10196 was taken in east face, 125 feet from shaft.

Samples 10195 and 10196 were wet and sample 10194 was moist when taken.

A composite sample was made by mixing the face samples 10194, 10195, and 10196. The results of an ultimate analysis of this sample are shown under laboratory number 10300.

Note.—The daily capacity of the mine at time of sampling was 40 tons.

For chemical analyses of this coal see part I of this bulletin, p. 123.

RICHMOND. NO. 2 MINE.

Sample.—Bituminous coal; Missouri field; analyses Nos. 10197, 10198, 10199, 10235 (p. 123).

Mine.—No. 2; Richmond district; 3 miles southwest of Richmond, in sec. 12, T. 51 N., R. 28 W., on a branch of the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—Lexington. Carboniferous age, Pennsylvanian series, Des Moines group. The roof is slate overlain with "soapstone"; the floor is soft underclay. The bed is 2½ feet thick at the points sampled and has a sandy shale parting. The cover for the most part is 73 feet thick.

The bed was measured and sampled by J. M. Webb on March 30, 1910, at three points, as described below:

Sections of coal bed in No. 2 mine, 3 miles southwest of Richmond.

Laboratory No.	10197 10198 10199	
Roof, slaty shale:	*Ft.*	*in.*
Coal	0	8
Blue sandy shale[a]	0	2
Coal	1	8
Floor, soft underclay.		
Thickness of bed	2	6
Thickness of coal sampled	2	4

[a] Not included in sample.

Sample 10197 was taken in north face, 800 feet from shaft.

Sample 10198 was taken in face, 800 feet northwest of shaft.

Sample 10199 was taken in east face, 400 feet from shaft bottom.

The samples were moist when taken.

A composite sample was made by mixing samples 10197, 10198, and 10199. The results of an ultimate analysis of this sample are shown under laboratory number 10235.

Note.—The daily output at time of sampling was 125 tons.

For chemical analyses of this coal see part I of this bulletin, p. 123.

SULLIVAN COUNTY.

MILAN. NO. 1 MINE.

Sample.—Bituminous coal; Novinger field; analyses Nos. 10125, 10126, 10143 (p. 124).

Mine.—No. 1; ½ mile west of Milan (Polk Township), on the Chicago, Burlington & Quincy and the Quincy, Omaha & Kansas City Railroads.

Coal bed.—Bevier coal. Carboniferous age, Pennsylvanian series, Cherokee shale. The roof is white shale overlain with gray and red shale and "soapstone." The floor is soft underclay. The bed is 4 feet 2 inches thick, with two partings at the points sampled. It lies flat. The cover for the most part is 200 feet thick.

The bed was measured and sampled on March 18, 1910, by J. M. Webb, in two places as described on the following page:

Sections of coal bed in No. 1 mine, ½ mile west of Milan.

Laboratory No	10125 10126	
Roof, white shale.	*Ft.*	*in.*
Coal	2	2
Clay [a]	0	2
Coal	0	4
Blue shale, bench rock [a]	0	10
Coal	0	8
Floor, soft underclay.		
Thickness of bed	4	2
Thickness of coal sampled	3	2

[a] Not included in sample.

Sample 10125 was taken in southeast face, 500 feet southeast of shaft bottom.

Sample 10126 was taken in south face, 600 feet south of hoisting shaft.

Sample 10125 was dry when taken; sample 10126 was wet when taken.

A composite sample was made by mixing the face samples 10125 and 10126. The results of an ultimate analysis of this sample are shown under laboratory No. 10143.

Notes.—The coal in this mine is used chiefly for domestic purposes. The daily capacity at time of sampling was 30 tons.

For chemical analyses of this coal see part I of this bulletin, p. 124.

MONTANA.

BROADWATER COUNTY.

LOMBARD. MONTANA BITUMINOUS MINE.

Sample.—Bituminous coal; Lombard field; analysis No. 3665 (p. 124).

Mine.—Montana Bituminous; at Lombard, in sec. 12, T. 4 N., R. 2 E., on the Northern Pacific Railway.

Coal bed.—No name. Cretaceous age.

The bed was sampled and measured in 1906 by J. P. Rowe. No record of the sections was preserved.

The sample was taken 300 feet in the mine.

For chemical analyses of this coal see part I of this bulletin, p. 124.

LOMBARD. HEGG MINE.

Sample.—Bituminous coal; Lombard field (Denver No. 22); analyses Nos. 563–D, 564–D (p. 124).

Mine.—Hegg; a drift mine, 1 mile west of Lombard, on the Northern Pacific Railway.

Coal bed.—Not named. Cretaceous age. Thickness, fairly uniform; roof of coal; floor of coal.

The bed was measured and sampled at two points by K. M. Way, on September 10, 1908, as described below:

Sections of coal bed in Hegg mine, 1 mile west of Lombard.

Section	A		B	
Laboratory No	563–D		564–D	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11½	1	3
Shale and mother coal	0	¾	0	¾
Coal	7	6	5	3
Floor, coal.				
Thickness of bed	8	6¼	6	6¾
Thickness of coal sampled	8	6¼	6	6¾

Section A (sample 563-D) was measured 300 feet north of the slope.

Section B (sample 564-D) was measured 400 feet northeast of the slope in rib on east entry 1. The entire thickness of the bed was not exposed; it was estimated to be 9 to 30 feet thick.

Note.—Small pyrite lenses are scattered promiscuously through the coal bed at this mine.

For chemical analyses of this coal see part I of this bulletin, p. 124.

CARBON COUNTY.

BEAR CREEK. NEW MINE.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 3619 (p. 124).

Mine.—New; in the NE. ¼ sec. 6, T. 8 S., R. 21 E., at Bear Creek.

Coal bed.—No. 3. Tertiary age, Fort Union formation.

The sample was taken at point 400 feet from mouth at face of entry. No record of the sections was preserved.

For chemical analyses of this coal see part I of this bulletin, p. 124.

BEAR CREEK. INTERNATIONAL MINE.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 5819 (p. 124).

Mine.—International; 1 mile northwest of Bear Creek, in the NE. ¼ sec. 6, T. 8 S., R. 21 E.

Coal bed.—No. 5. Tertiary age, Fort Union formation. The bed is about 16 feet thick.

The bed was measured and sampled by E. G. Woodruff in 1907, as shown below:

Section of coal bed in International mine, 1 mile northwest of Bear Creek.

Laboratory No	5819	
	Ft.	*in.*
Coal	2	11
Parting [a]	0	1
Coal	0	3
Parting	0	½
Coal	0	9
Shale [a]	8	6
Coal [a]	0	10
Parting [a]	0	1
Coal [a]	1	4
Parting [a]	..	..
Coal [a]	1	5
Thickness of bed	16	2½
Thickness of coal sampled	3	11½

[a] Not included in sample.

The sample was taken 200 feet from the entrance of the mine.

Notes.—The coal from this mine, like that from most other mines in the field, is so well jointed that it can be broken into merchantable sizes with only a small proportion of slack. It has the average hardness of subbituminous coal and is free from pyrite nodules. Only a small amount of powder is necessary in mining. The total production in 1907 was about 15,000 tons, mostly from development work.

For chemical analyses of this coal see part I of this bulletin, p. 124; also U. S. Geol. Survey Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

BEAR CREEK. FOSTER GULCH MINE.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 4007 (p. 125).

Mine.—Foster Gulch; Bear Creek district; 1 mile south of Bear Creek.

Coal bed.—No. 3. Tertiary age, Fort Union formation. The bed is about 6 feet thick at this point.

The bed was measured and sampled on October 15, 1906, by N. H. Darton, as shown below:

Section of coal bed in Foster Gulch mine, 1 mile south of Bear Creek.

Laboratory No	4007	
	Ft.	*in.*
Coal	5	8
Shale [a]	0	11
Bone [a]	0	7
Coal	1	2
Thickness of bed	8	4
Thickness of coal sampled	6	10

[a] Not included in sample.

Notes.—The coal from this mine is so well jointed that it can be broken into marketable sizes with only a small proportion of slack. It has the average hardness of subbituminous coal and is free from pyrite nodules. Only a small quantity of powder is necessary in mining. Two main entries had been opened in 1907.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 316, p. 193; Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

BEAR CREEK. PROSPECT.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 3620 (p. 125).

Location.—Prospect in Bear Creek district; 1 mile west of Bear Creek; in the NW. ¼ sec. 6, T. 8 S., R. 21 E.

Coal bed.—No. 2. Tertiary age, Fort Union formation. The bed is about 8 feet 8 inches thick, with partings of shale. Sandstone roof and shale floor.

The bed was measured and sampled by J. P. Rowe on August 18, 1906, as shown below:

Section of coal bed in prospect, 1 mile west of Bear Creek.

Laboratory No	3620	
Roof, sandstone.	*Ft.*	*in.*
Coal	1	0
Shale [a]	0	1
Coal	0	6
Shale [a]	0	2
Coal	1	1
Shale [a]	0	2
Coal	1	3
Shale [a]	0	1
Coal	0	4
Shale [a]	0	2
Coal	3	10
Floor, shale.		
Thickness of bed	8	8
Thickness of coal sampled	8	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 316, p. 193; Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

BEAR CREEK. BEAR CREEK MINE.

Sample.—Subbituminous coal, Red Lodge field; analyses Nos. 5820, 5822, 5823 (p. 125).

Mine.—Bear Creek; Bear Creek district; in sec. 6, T. 8 S., R. 21 E., 1½ miles west of Bear Creek.

Coal bed.—No. 2, No. 3, and No. 4. Tertiary age, Fort Union formation.

The beds were measured and sampled on September 29, 1907, by E. G. Woodruff as shown below:

Sections of coal beds in Bear Creek mine, 1½ miles west of Bear Creek.

Laboratory No.	5820		5822		5823	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	5	6	1	2	0
Shale	[a]0	3	..	..	[a]0	1
Bone	..	..	..	..	..	..
Coal	4	10	..	..	1	9
Thickness of bed	5	6	6	1	3	10
Thickness of coal sampled	5	3	6	1	3	9

[a] Not included in sample.

Sample 5820 was taken from bed No. 2, at breast of main heading.

Sample 5822 was taken from bed No. 3, 200 feet in the mine.

Sample 5823 was taken from bed No. 4, 100 feet in the mine.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

Bear Creek. Washoe No. 1 Mine.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 5821 (p. 125).

Mine.—Washoe No. 1; 2 miles west of Bear Creek, in sec. 1, T. 8 S., R. 20 E.

Coal bed.—No. 1. Tertiary age, Fort Union formation. The bed is about 6 feet 4 inches thick in this mine and dips slightly to the southwest.

The bed was measured and sampled by E. G. Woodruff on October 22, 1907, as shown below:

Section of coal bed in Washoe No. 1 mine, 2 miles west of Bear Creek.

Laboratory No.	5821	
	Ft.	*in.*
Coal	3	6
Shale [a]	0	8
Coal	1	0
Shale [a]	0	2
Coal	1	0
Thickness of bed	6	4
Thickness of coal sampled	5	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

Bear Creek. Nelson Mine.

Sample.—Subbituminous coal; Red Lodge field; analysis No. 4008 (p. 125).

Mine.—Nelson; about 3½ miles south of Bear Creek, in Taggart Gulch, in the SE. ¼ sec. 20, T. 8 S., R. 21 E.

Coal bed.—No. 2. Tertiary age, Fort Union formation. The bed is about 5 feet 3 inches thick at this mine.

The bed was measured and sampled by N. H. Darton on October 15, 1906, as shown below:

Section of coal bed in Nelson mine, 3½ miles south of Bear Creek.

Laboratory No.	4008	
	Ft.	*in.*
Coal	0	5
Bone [a]	0	3
Coal	2	3
Parting [a]	..	..
Coal	2	7
Thickness of bed	5	6
Thickness of coal sampled	5	3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 341, p. 105; Bull. 316, p. 193.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 94.

Bridger. Bridger Mine.

Sample.—Bituminous coal; Bridger field; analyses Nos. 3684, 3955, 3956 (Montana No. 3), and analysis No. 5495 (p. 125).

Mine.—Bridger; 1½ miles northwest of Bridger, in SW. ¼ SW. ¼ sec. 17, T. 6 S., R. 23 E.

Coal bed.—Bridger. Cretaceous age, Eagle sandstone. The bed dips 6° southwest at this mine and is about 8 feet 1 inch thick. The workings are 800 feet deep.

The bed was measured and sampled by N. H. Darton in 1906, and by C. W. Washburne in 1907, as shown below:

Section of coal bed in Bridger mine, 1½ miles northwest of Bridger.

Laboratory No.	3956		5495	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	2	1	2
Shale	0	11	0	6
Coal	3	6	[b] 3	6
Shale and sandstone	1	0	..	..
Shale	0	6	1	6
Coal	1	0	1	0
Thickness of bed	8	1	7	8
Thickness of coal sampled [a]	4	5	3	6

[a] The record does not state in what part of the section was the 4 feet 5 inches of coal sampled.
[b] Part sampled.

Sample 3956 was taken 600 feet in mine.

Sample 5495 was taken 5,000 feet in mine.

Sample 3955 was taken in the northern part of the mine, the poor coal being excluded.

Sample 3684 was taken at an earlier period. There is no information regarding the section it represented.

Notes.—The coal is hard, keeps well, and sells for $1 more per ton in the Montana market than some other coals. The coal was sold both as lump and nut coal. The egg and pea sizes went into the cars without being separated from the rest. The maximum output of the mine was about 250 tons a day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: Bureau of Mines Bull. 23, pp. 65, 171; producer-gas tests: Bureau of Mines Bull. 13, pp. 170, 274.

For chemical analyses see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 316, p. 193; Bull. 332, p. 176; Bull. 341, p. 198.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 167.

Coalville. Gebo No. 2 Mine.

Sample.—Bituminous coal; Bridger field; analysis No. 5508 (p. 125).

Mine.—Gebo No. 2; in the NW. ¼ sec. 18, T. 5 S., R. 23 E., 1 mile west of Coalville.

Coal bed.—Bridger. Cretaceous age, Eagle sandstone. The bony coal used as the roof is 2 feet thick. The bed dips about 6° W. The floor is bony coal.

The bed was measured and sampled by M. A. Pishel in 1907, as shown below:

Section of coal bed in Gebo No. 2 mine, 1 mile west of Coalville.

Laboratory No.	5508	
Roof, bony coal.	*Ft.*	*in.*
Coal, good	1	1
Coal, bony[a]	1	4
Coal, good	3	0
Floor, bony coal.		
Thickness of bed	5	5
Thickness of coal sampled	4	1

[a] Not included in sample.

The sample was taken 1,000 feet in the mine.

Notes.—The mine is worked by the room-and-pillar system. The coal was mined by electric machines until 1907, when, owing to a strike among the miners, the machines were taken out and hand mining was adopted. The output at the time of sampling was about 200 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 341, p. 198.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 167.

Dean. Albertson Mine.

Sample.—Bituminous coal; Upper Stillwater Basin; analysis No. 6314 (p. 125).

Mine.—Albertson; in the SE. ¼ NW. ¼ sec. 28, T. 4 S., R. 16 E., about 5 miles northwest of Dean.

Coal bed.—The bed is included in the Eagle (?) sandstone; Cretaceous (lower Montana) age. It has sandstone roof and floor. The dip at the mine is slight, but increases greatly in a short distance. Entry in July, 1908, was 250 feet long.

The bed was measured and sampled in 1908 by F. H. Kay, as shown below:

Section of coal bed in Albertson mine, 5 miles northwest of Dean.

Laboratory No.	6314	
Roof, sandstone.	*Ft.*	*in.*
Coal	0	10
Sandstone	0	1
Coal	0	11
Bone	0	1
Coal	0	8
Bone	0	4
Sandstone	0	4
Bone	2	10
Coal	1	0
Floor, sandstone.		
Thickness of bed	7	1

The sample was taken at the face of the entry.

Note.—At the time of sampling the mine had been opened several years; it had furnished a small amount of coal, chiefly in winter, for local use.

For chemical analyses of this coal see part I of this bulletin, p. 125.

Fromberg. McCarthy No. 2 Mine.

Sample.—Bituminous coal; Bridger field; analysis No. 3954 (p. 125).

Mine.—McCarthy No. 2 (also known as Carbon mine); in the SE. ¼ SW. ¼ sec. 18, T. 5 S., R. 23 E., about 1 mile west of Fromberg.

Coal bed.—Bridger (lignite). Upper Cretaceous age, Eagle formation. The floor is sandstone. The bed dips 5° W. Three feet of poor coal is used as a roof in mining; this coal is overlain with sandstone.

The bed was measured and sampled by N. H. Darton in 1906, as shown below:

Section of coal bed in McCarthy No. 2 mine, 1 mile west of Fromberg.

Laboratory No.	3954	
Roof, sandstone.	*Ft.*	*in.*
Coal [a]	3	0
Coal	0	6
Bone [a]	0	9
Coal	2	0
Bone [a]	0	6
Coal	2	4
Floor, sandstone.		
Thickness of bed	9	1
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken 700 feet in mine.

For results of tests of this coal see mention of specific tests, as follows—steaming tests: Bureau of Mines Bull. 23, pp. 65, 171; producer-gas tests: Bureau of Mines Bull. 13, pp. 141, 274.

For chemical analyses see part I of this bulletin, p. 125; also U. S. Geol. Survey Bull. 316, p. 193; Bull. 332, p. 174; Bull. 341, p. 198.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 167.

JOLIET. JOLIET MINE.

Sample.—Subbituminous coal; Bridger field; analysis No. 3683 (p. 126).

Mine.—Joliet; 2½ miles southeast of Joliet.

Coal bed.—Bridger. Upper Cretaceous age, Eagle sandstone.

The bed was measured and sampled in 1906 by J. P. Rowe.

For chemical analyses of this coal see part I of this bulletin, p. 126.

RED LODGE. NORTHWESTERN IMPROVEMENT MINE.

Sample.—Bituminous coal; Red Lodge field; analyses Nos. 3590, 3592, 3588, 3595, 3591, 3593, 3594 (p. 126).

Mine.—Northwestern Improvement; on the east side of Rock Creek, in sec. 27, T. 7 S., R. 20 E., at Red Lodge.

Coal beds.—Nos. 1, 1½, 2, 4, 5, and 6. Tertiary age, Fort Union formation. The beds vary in thickness from 4 to 12 feet.

The beds were measured and sampled by J. P. Rowe in 1906, as described below:

Section of No. 2 coal bed in Northwestern Improvement mine at Red Lodge.

Laboratory No.	3588	
Roof, sandstone.	*Ft.*	*in.*
Coal	1	0
Shale [a]	0	1
Coal	0	6
Shale [a]	0	2
Coal	1	1
Shale [a]	0	2
Coal	1	3
Shale [a]	0	1
Coal	0	4
Shale [a]	0	2
Coal	3	10
Floor, shale.		
Thickness of bed	8	8
Thickness of coal sampled	8	0

[a] Not included in sample.

The sample was taken 1,600 feet from main entry.

Section of No. 4 coal bed in Northwestern Improvement mine at Red Lodge.

Laboratory No	(a)	
	Ft.	in.
Roof, gray shale.		
Coal	2	6
Parting[b]	0	1
Coal	5	7
Shale[b]	0	1
Coal	1	11
Floor, gray shale.		
Thickness of bed	10	2
Thickness of coal sampled	10	0

[a] It is not known whether analysis No. 3591 or analysis No. 3595 is represented by the section given above.
[b] Not included in sample.

Sample 3591 was taken from east room 97, 350 feet north, level 5.

Sample 3595 was taken 350 feet west of drift 5, west level 2.

Section[a] *of coal bed No. 5 in Northwestern Improvement mine at Red Lodge.*

Laboratory No	3593[a]	
	Ft.	in.
Roof, hard shale.		
Coal	1	9
Shale[b]	0	2
Coal	1	0
Shale[b]	0	1
Coal	3	2
Shale[b]	0	1
Coal	6	2
Floor, hard shale.		
Thickness of bed	12	5
Thickness of coal sampled	12	1

[a] The section as given has not been positively identified as the one from which the sample was taken for analysis.
[b] Not included in sample.

The sample was taken in room 9, west level 4.

Sample 3590 was taken from No. 1 bed. The bed is about 7 feet thick, and is overlain with carbonaceous shale and underlain with 4 to 6 inches of shale above sandstone. The sample taken represented 7 feet of clean coal.

Sample No. 3592 was taken from No. 1½ bed, room 31, 1,600 feet from main entrance, 250 feet north of tramway. The bed is 5 feet thick with many thin partings and has a sandstone roof and shale floor. The sample represented 5 feet of coal.

Sample 3594 was taken from No. 6 bed and represented a 4-foot 11-inch cut of clean coal. It was taken in room 9, west level 4.

Notes.—In 1907 the tipple was equipped with a shaking screen, from which the coal passed to picking tables, where the lump coal was assorted for shipment. The screenings were sent to a washer, where the impurities, which consisted of shale, bone, and pieces of sandstone, were removed.

For chemical analyses of this coal see part I of this bulletin, p. 126; also U. S. Geol. Survey Bull. 316, p. 193; Bull. 341, p. 105.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 105.

CASCADE COUNTY.

ARMINGTON. RICHARDSON MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3515 (p. 126).

Mine.—Richardson; Belt district; on the east side of Belt Creek at Armington, in the NE. ¼ sec. 36, T. 19 N., R. 6 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is about 4½ feet thick, including partings of bone and bony coal.

The bed was measured and sampled by C. A. Fisher in 1906, as shown on the following page:

Section of coal bed in Richardson mine at Armington.

Laboratory No	3515	
	Ft.	*in.*
Coal	1	10
Bone[a]	0	9
Coal	0	8½
Bony coal[a]	0	3
Coal	1	4
Thickness of bed	4	10½
Thickness of coal sampled	3	10½

[a] Not included in sample.

Note.—In 1906 the output of the mine, which was small, was sold in Armington and to ranchmen along Belt Creek Valley.

For chemical analyses of this coal see part I of this bulletin, p. 126; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

ARMINGTON. HILL MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3755 (p. 127).

Mine.—Hill; Belt district; abandoned mine near Armington on the west side of Belt Creek, in the SE. ¼ SW. ¼ sec. 36, T. 19 N., R. 6 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is 5 feet thick, with several partings of bone and bony coal.

The bed was measured and sampled by C. A. Fisher on August 2, 1906, as shown below:

Section of coal bed in Hill mine near Armington.

Laboratory No	3755	
	Ft.	*in.*
Coal	2	1
Bone[a]	0	9
Bony coal[a]	0	7
Bone[a]	0	6
Coal	1	1
Thickness of bed	5	0
Thickness of coal sampled	3	2

[a] Not included in sample.

The sample was taken 75 feet from the mouth of the mine.

Notes.—The coal is seemingly of good quality, but the bed contains some sulphur in the form of iron-pyrite nodules. The uppermost bench is characterized by joint planes running at right angles, separating the coal into small cubical blocks.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

BELT. MILLARD MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3513 (p. 127).

Mine.—Millard; Belt district; a few hundred yards south of the Schmauch mine, on the east side of Belt Creek, at Belt, in the SE. ¼ NE. ¼ sec. 26, T. 19 N., R. 6 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is about 6 feet thick with partings that separate it into 3 benches.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Section of coal bed in the Millard mine at Belt.

Laboratory No	3513
	Ft. in.
Coal	2 6
Bony coal[a]	0 3
Coal	0 6
Bone[a]	0 3½
Coal	2 4
Thickness of bed	5 10½
Thickness of coal sampled	5 4

[a] Not included in sample.

The sample was taken from an entry driven about 700 feet from outcrop.

Notes.—In 1906 the mine had a very small output; most of the coal was sold in the town of Belt. The lowest bench was regarded by the miners as the best coal, the middle and uppermost benches being considered slightly inferior.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

Belt. Anaconda Mine.

Sample.—Bituminous coal; Great Falls field; analyses Nos. 3512, 3514 (p. 127).

Mine.—Anaconda, on the west side of Belt Creek, near Belt, in the SE. ¼ NW. ¼ sec. 26, T. 19 N., R. 6 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed has an average thickness of 6 feet, with several partings.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Sections of coal bed in Anaconda mine near Belt.

Laboratory Nos	3512	3514
	Ft. in.	*Ft. in.*
Coal	1 9	1 4
Bone[a]	0 8	0 8
Coal	0 5	0 7½
Shale[a]	0 4	.. ..
Bone[a]	.. ..	0 4½
Coal	2 8	2 5½
Thickness of bed	5 10	5 5½
Thickness of coal sampled	4 10	4 5

[a] Not included in sample.

Sample 3514 was taken from south entry 9.

Sample 3512 was taken from south entry 18.

Notes.—Sulphur in the form of pyrite nodules occurs in all of the benches. Owing to the large amount of these impurities it is necessary to wash the machine-mined coal. The iron-pyrite nodules removed by this process are shipped as a by-product to the large copper smelters at Great Falls, where they are used as additional fuel and flux in the blast-furnace charge. This utilization meets the cost of separating the pyrite from the coal.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

BELT. ORR MINE.

Sample.—Bituminous coal; Great Falls field; analysis 3754 (p. 127).

Mine.—Orr: Belt district; about 1½ miles north of Belt, on the east side of Belt Creek, in the NE. ¼ sec. 23, T. 19 N., R. 6 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is 6 feet 2 inches thick, with several partings.

The bed was measured and sampled by C. A. Fisher on September 5, 1906, as shown below:

Section of coal bed in Orr mine, 1½ miles north of Belt.

Laboratory No	3754	
	Ft.	*in.*
Coal	1	10
Bone[a]	0	10
Coal	0	7
Bone[a]	0	12
Coal	0	10
Bone[a]	0	3
Coal	0	10
Thickness of bed	6	2
Thickness of coal sampled	4	1

[a] Not included in sample.

The sample was taken 500 feet from the mouth of the main entry.

Notes.—At the time of sampling, the coal from the entries had not been marketed. The coal is not firmly bedded. The main entry had been driven 700 feet.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

EDEN. BICKETT MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 4118 (p. 127).

Mine.—Bickett; Smith River district; 2 miles northeast of Eden, on the north side of Ming Coulee, in the NW. ¼ SE. ¼ sec. 32, T. 18 N., R. 4 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The coal zone or bed is about 18 feet thick; workable bed 7 feet 9 inches thick; dips at a small angle to the northwest; roof is shale and floor is clay. There is a parting of bony coal.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Section of coal bed in Bickett mine, 2 miles northeast of Eden.

Laboratory No	4118	
Roof, shale.	*Ft.*	*in.*
Coal	3	7
Bony coal[a]	0	8
Coal	3	6
Floor, clay.		
Thickness of bed	7	9
Thickness of coal sampled	7	1

[a] Not included in sample.

Notes.—The upper 10 feet of the 18-foot bed does not contain workable coal. The base of the lowest bench contains considerable "sulphur" in nodular form.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

EDEN. PATTERSON MINES.

Sample.—Bituminous coal; Great Falls field; analysis No. 4117 (p. 127).

Mines.—Patterson; Smith River district; on the high bluffs on the east side of Smith River, 6 miles southwest of Eden, a short distance above the mouth of Hound Creek, in the NW. ¼ NW. ¼ sec. 20, T. 17 N., R. 3 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. At this mine the bed is 4 feet 10 inches thick.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Section of coal bed in Patterson mine, 6 miles southwest of Eden.

Laboratory No.	4117	
	Ft.	*in.*
Coal, bony [a]	0	3
Coal	4	7
Thickness of bed	4	10
Thickness of coal sampled	4	7

[a] Not included in sample.

For chemical analysis of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 80.

EDEN. CARVILLE MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 4114 (p. 127).

Mine.—Carville; Smith River district; 8 miles southwest of Eden, on the west side of Hound Creek, in the SW. ¼ SE. ¼ sec. 24, T. 17 N., R. 2 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed at this mine is 5 feet 6 inches thick, with no appreciable partings.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Section of coal bed in Carville mine, 8 miles southwest of Eden.

Laboratory No.	4114	
	Ft.	*in.*
Coal	5	0
Dull coal [a]	0	6
Thickness of bed	5	6
Thickness of coal sampled	5	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

GEYSER. NOLLAR MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3759 (p. 127).

Mine.—Nollar; on the west side of Otter Creek, about 7 miles southwest of Geyser, in the NW. ¼ sec. 29, T. 17 N., R. 9 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed at this mine is 4 feet thick, with no partings of appreciable thickness.

The bed was measured and sampled in 1906. The sample, representing a 4-foot cut of coal was taken 175 feet from the mouth of the mine.

Notes.—During the four years preceding the date of sampling in 1906, the total output had not exceeded 300 tons. The coal was mined at few tons at a time to supply a local trade.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

GEYSER. MEREDETH MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3758 (p. 127).

Mine.—Meredeth; in the SW. ¼ NW. ¼ sec. 3, T. 16 N., R. 9 E., 7½ miles southwest of Geyser.

Coal bed.—No name. Cretaceous age, Kootenai formation.

The bed was measured and sampled by C. A. Fisher on August 9, 1906, as shown below:

Section of coal bed in Meredeth mine, 7½ miles southwest of Geyser.

Laboratory No.	3758	
	Ft.	*in.*
Coal	2	7
Bone [a]	1	3
Coal	1	0
Thickness of bed	4	10
Thickness of coal sampled	3	7

[a] Not included in sample.

The sample was taken 50 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 68.

SAND COULEE. GERBER MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 4119 (p. 127).

Mine.—Gerber; Sand Coulee district; on west side of Straight Coulee, a tributary of Sand Coulee, about 1 mile south of the town of Sand Coulee, in the NE. ¼ sec. 23, T. 19 N., R. 4 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is from 6 to 9 feet thick, with two partings. It lies nearly level.

The bed was measured and sampled at four points by C. A. Fisher in 1906, as shown below:

Sections of coal bed in Gerber mine, 1 mile south of Sand Coulee.

Section No.	A		B		C		D	
Laboratory No.			4119					
Roof, strong shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	2	6	8½	5	8½	4	6
Shale [a]	0	8	..	..	..	..	..	..
Coal	6	1½	..	..	..	..	..	..
Bony coal [a]		2½	0	5½	0	9½	0	6
Coal	2	8	2	2	1	10	2	2
Floor, compact clay.								
Thickness of bed	12	10	9	4	8	4	7	2
Thickness of coal sampled	11	11½	8	10½	7	6½	6	8

[a] Not included in sample.

Section A was taken from the northeast entry.

Section B was taken from room 3.

Section C was taken from room 1.

Section D was taken from room 1.

Notes.—In 1906 the coal was all machine mined, and the bed was worked by the room-and-pillar system. The coal was fairly free from impurities, and such as occurred were taken out by hand picking in the mine and by screening at the tipple. Most of the output was shipped, the local sales being small.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

SPION KOP. LARSON MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3757 (p. 127).

Mine.—Larson; near Spion Kop, 1½ miles east of Reinsford, on the south side and at the mouth of Williams Creek, in the SE. ¼ NW. ¼ sec. 3, T. 17 N., R. 8 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed at this mine is about 30 inches thick. Roof and floor are of compact gray shale.

The bed was measured and sampled by C. A. Fisher on August 8, 1906. The sample represented 2 feet 6 inches of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 70.

STOCKETT. COTTONWOOD MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 4115 (p. 127).

Mine.—Cottonwood; at Stockett, in the NW. ¼ NW. ¼ sec. 36, T. 19 N., R. 4 E.

Coal bed.—Belt Creek. Lower Cretaceous age, Kootenai formation. The bed is from 5 to 10 feet thick, not including two partings. It has a bone roof and a clay floor and dips slightly to the north. Only the first and second benches were mined at the time of sampling.

The bed was measured and sampled by C. A. Fisher in 1906, as shown below:

Section of coal bed in Cottonwood mine at Stockett.

Laboratory No.	4115	
Roof, bone.	*Ft.*	*in.*
Coal[a]	0	10
Bony coal[a]	0	4
Coal[a]	1	10
Bony coal[a]	0	7
Coal	6	1
Bony coal[a]	0	6
Coal	1	3
Floor, clay.		
Thickness of bed	11	5
Thickness of coal sampled	7	4

[a] Not included in sample.

Notes.—This mine is equipped with an anthracite-type breaker, and in 1906 the coal was cleaned of sulphur balls and bone by picking and screening. The sizes made were broken egg, stove, nut, pea, and slack; the screens used had round holes 3, 2½, 2, 1½, and 1 inch in diameter. The refuse, separated by hand picking and by spiral pickers, was used for grading along the railroad. From 2,000 tons of run-of-mine coal daily dumped into the breakers, 200 tons of refuse, containing less than 1 per cent of coal, was removed. In 1906 the output was used by the railroad and was shipped to Great Falls and other places.

For chemical analyses of this coal see part I of this bulletin, p. 127; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 80.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 356, p. 50.

CHOUTEAU COUNTY.

Ada. Gibbitt's (Tiger Ridge) Mine.

Sample.—Subbituminous coal; Milk River field; analysis No. 8622 (p. 128).

Mine.—Gibbitt's (Tiger Ridge) Chinook district; 2½ miles southeast of Ada, in the NE. ¼ SE. ¼ sec. 5, T. 30 N., R. 18 E.

Coal bed.—Within the upper part of the Judith River formation, Montana group; Upper Cretaceous age. Thickness, variable.

The bed was measured and sampled by L. J. Pepperberg on July 30, 1909, as shown below:

Section of coal bed in Gibbitt's (Tiger Ridge) mine, 2½ miles southeast of Ada.

Laboratory No	8622	
Roof, shale.	*Ft.*	*in.*
Coal	0	4
Bone [a]	0	1
Coal	0	4
Bone [a]	0	6
Coal	1	8
Bone [a]	0	2
Floor, shale.		
Thickness of bed	3	1
Thickness of coal sampled	2	4

[a] Not included in sample.

The sample was taken about 60 feet from the mouth of the entry.

Notes.—The coal is noncoking. It has a bright black luster, dark-brown streak, semiconchoidal fracture, and two well-developed sets of joint planes, almost at right angles to each other. On exposure to the air, the coal checks. The sample probably represented coal within the weathered portion of the bed. The coal was mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 128.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

Big Sandy. Mackton Mine.

Sample.—Subbituminous coal; Milk River field; analyses No. 6550 (p. 128).

Mine.—Mackton mine; Big Sandy district; 6 miles east of Big Sandy, in the NW. ¼ SW. ¼ sec. 18, T. 28 N., R. 14 E.

Coal bed.—Big Vein. Tertiary age, Fort Union formation. Thickness, fairly uniform, dipping 40° E.

The bed was measured and sampled by L. J. Pepperberg in 1908, as shown below:

Section of coal bed in Mackton mine, 6 miles east of Big Sandy.

Laboratory No	6550	
Roof, shale.	*Ft.*	*in.*
Coal	2	5½
Bone, variable [a]	0	2
Coal	1	3
Bone [a]	0	7
Coal	0	6
Bone [a]	0	4
Coal	3	11
Floor, clay.		
Thickness of bed	9	2½
Thickness of coal sampled	8	1½

[a] Not included in sample.

The sample was taken about 155 feet from the mouth of the slope.

Notes.—The coal is subbituminous, noncoking. It is hard and brittle, with a bright black luster. The bed has two sets of joint planes, one of which is better developed than the other. On exposure this coal weathers more slowly than those belonging to the Judith River formation in this field; hence it is a better stocking coal. The sample represented fresh unaltered coal. In 1908 the coal was shipped to Havre, Chinook, Helena, and Great Falls, Mont. A few carloads had been shipped to Seattle and Spokane, Wash.

For chemical analyses of this coal see part I of this bulletin, p. 128; also U. S. Geol. Survey Bull. 381, p. 105.

BIG SANDY. MACK MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6609 (p. 128).

Mine.—Mack; Big Sandy district; in the NE. ¼ SE. ¼ sec. 18, T. 28 N., R. 14 E, 6½ miles east of Big Sandy.

Coal bed.—The coal is of Tertiary age, Fort Union formation. Thickness fairly uniform.

The bed was measured and sampled by L. J. Pepperberg and V. H. Barnett in 1908, as shown below:

Section of coal beds in Mack mine, 6½ miles east of Big Sandy.

Laboratory No.	6609	
	Ft.	*in.*
Roof, bone [a]	2	4
Coal, clear	4	6
Floor, clay, shale.		
Thickness of bed	6	10
Thickness of bed sampled	4	6

[a] Not included in sample.

The sample was taken about 20 feet from the mouth of the entry and 200 feet off the main entry west.

Notes.—The coal is noncoking. It is hard and brittle and in general like that from the Macton mine. The sample represented fresh unaltered coal. In 1908 the coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 128; also U. S. Geol. Survey Bull. 381, p. 105.

CHINOOK. SANDS & O'KEEF MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6316 (p. 128).

Mine.—Sands & O'Keef; Chinook district; in the NW. ¼ NW. ¼ sec. 18, T. 33 N., R. 19 E., 4 miles west of Chinook.

Coal bed.—Within the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in the Sands & O'Keef mine, 4 miles west of Chinook.

Laboratory No.	6316	
Roof, bone.	*Ft.*	*in.*
Coal	1	0
Clay [a]	0	2
Coal	1	7
Bone [a]	1	2
Coal	2	6
Floor, carbonaceous shale.		
Thickness of bed	6	5
Thickness of coal sampled	5	1

[a] Not included in sample.

The sample was taken about 250 feet from the mouth of the entry.

Notes.—The coal is subbituminous, a "black lignite;" it has a bright luster, dark brown streak, semiconchoidal fracture, two joint planes well developed and almost at right angles to each other. On exposure to the air it loses moisture rapidly and checks or disintegrates into small irregular bits. The sample probably represented coal which had been affected by weathering. In 1908 the coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 128; also U. S. Geol. Survey Bull. 381, p. 105.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

CHINOOK. LEABOS MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 7156 (p. 128).

Mine.—Leabos outcrop; in sec. 29, T. 34 N., R. 19 E., 6 miles northwest of Chinook; no railroad connection.

Coal bed.—No name. Cretaceous age, Judith River formation.

The bed was measured and sampled on August 13, 1908, by L. J. Pepperberg, as shown below:

Section of coal bed at the Leabos mine, 6 miles northwest of Chinook.

Laboratory No	7156	
	Ft.	*in.*
Coal	0	8
Bone [a]	1	0
Coal	3	4
Thickness of bed	5	0
Thickness of coal sampled	4	0

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 128; also U. S. Geol. Survey Bull. 471.

For geologic relations see U. S. Geol. Survey Bull. 471.

CHINOOK. KERR MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6317 (p. 128).

Mine.—Kerr; Chinook district; 7 miles south of Chinook, in the NW. ¼ SW. ¼ sec. 30, T. 32 N., R. 20 E.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Upper Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in the Kerr mine, 7 miles south of Chinook.

Laboratory No	6317	
Roof, shale, carbonaceous.	*Ft.*	*in.*
Coal	0	6
Coal, bony	0	5
Coal, clean	2	5
Floor, bone.		
Thickness of bed	3	4
Thickness of coal sampled	2	11

[a] Not included in sample.

The sample was taken about 240 feet from the mouth of the entry.

Notes.—The coal is in general much like that from other mines working the beds in the upper part of the Judith River formation in this district. The sample probably represented coal still within the weathered portion of the bed. In 1908 the coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 128; also U. S. Geol. Survey Bull. 381, p. 105.

CHINOOK. RODER MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6319 (p. 128.)

Mine.—Roder; Chinook district; in the SW. ¼ NW. ¼ sec. 5, T. 31 N., R. 19 E., 9 miles south of Chinook. No railroad connection.

Coal bed.—No name. Cretaceous age, Judith River formation.

The bed was measured and sampled in 1908 by V. H. Barnett, as shown below:

Section of coal bed in Roder mine, 9 miles south of Chinook.

Laboratory No	6319	
	Ft.	*in.*
Coal	0	10
Shale [a]	0	3
Bone [a]	0	4
Coal	0	4
Bone [a]	0	10
Coal	2	0
Thickness of bed	4	7
Thickness of coal sampled	3	2

[a] Excluded from sample.

The sample was taken 125 feet from the mouth of the entry.

For chemical analyses of this coal see part I of this bulletin, p. 128.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

CHINOOK. RODER PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 9150 (p. 128).

Mine.—Roder prospect; Chinook district; 9 miles south of Chinook, in the SW. ¼ NW. ¼ sec. 5, T. 31 N., R. 19 E.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and samped by L. J. Pepperberg in 1909, as shown below:

Section of coal bed in Roder prospect, 9 miles south of Chinook.

Laboratory No	9150	
	Ft.	*in.*
Roof, shale.		
Coal, clear	1	1½
Clay [a]	0	3
Coal		3
Bone [a]	0	1½
Coal	0	6
Bone [a]	0	4
Coal, slightly bony	0	3
Coal, clear	1	4
Bone [a]	0	3
Coal	0	10
Floor, shale.		
Thickness of bed	5	3
Thickness of coal sampled	4	3½

[a] Not included in sample.

The sample was taken about 150 feet from the mouth of the entry.

Notes.—The coal is noncoking. Bright black luster, dark brown streak and semiconchoidal fracture. The bed has two sets of joint planes well developed, which intersect almost at right angles. On exposure to the air, the coal loses moisture rapidly and checks or disintegrates into small irregular bits. The sample probably represented coal still within the weathered portion of the bed. In 1908 the coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 128.

For geologic relations see U. S. Geo. Survey Bull. 381, p. 85.

CHINOOK. TUMBLER PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 6318 (p. 128).

Mine.—Tumbler prospect; Chinook district, in the NW. ¼ NW. ¼ sec. 32, T. 32 N., R. 19 E., about 6 miles southwest of Chinook.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Tumbler prospect, 6 miles southwest of Chinook.

Laboratory No	6318	
Roof, coal.	*Ft.*	*in.*
Coal	2	4
Bone [a]	0	1½
Coal	0	7½
Bone [a]	0	3
Coal	2	0
Floor, carbonaceous shale.		
Thickness of coal bed	5	4
Thickness of coal sampled	4	11½

[a] Not included in sample.

The sample was taken about 250 feet from the mouth of the entry.

Notes.—The coal is, in general, like that from the Roder prospect. The sample probably represented coal still within the weathered portion of the bed. The coal was mined for local use in 1908.

For chemical analyses of this coal, see part I of this bulletin, p. 128; also, U. S. Geol. Survey Bull. 381, p. 105.

For geologic relations, see U. S. Geol. Survey Bull. 381, p. 85.

CHINOOK. MATHESON PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 6380 (p. 128).

Mine.—Matheson prospect; Chinook district, in the NE. ¼ SW. ¼ sec. 10, T. 33 N., R. 20 E., about 4 miles northeast of Chinook.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Matheson prospect, 4 miles northeast of Chinook.

Laboratory No	6380	
Roof, shale.	*Ft.*	*in.*
Coal	2	0
Bone [a]	0	4
Bone [a]	1	0
Clay [a]	0	6
Coal	0	1
Floor, bone.		
Thickness of bed	4	11
Thickness of coal sampled	4	0

[a] Not included in sample.

The sample was taken about 65 feet from the mouth of the entry.

Notes.—The coal is noncoking, contains some mineral charcoal, has a reddish-brown streak, and slacks readily on being exposed to the air. The sample probably represented coal still within the weathered portion of the bed. In 1908 the coal was mined for local use.

For chemical analyses of this coal, see part I of this bulletin, p. 128; also, U. S. Geol. Survey Bull. 381, p. 105.

For geologic relations, see U. S. Geol. Survey Bull. 381, p. 85.

CHINOOK. LEABO PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 6381 (p. 128).

Mine.—Leabo prospect; Chinook district; in the SW. ¼ sec. 29, T. 34 N., R. 19 E., about 6¾ miles north of Chinook.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Leabo prospect, 6¾ miles north of Chinook.

Laboratory No.	6381	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal[a]	0	8
Bone[a]	1	0
Coal	3	4
Floor, bone.		
Thickness of bed	5	0
Thickness of coal sampled	3	4

[a] Not included in sample.

The sample was taken about 45 feet from the mouth of the entry.

Notes.—The coal is a "black lignite," has a bright luster, dark-brown streak, and semiconchoidal fracture. Two sets joint planes are well developed; they intersect almost at right angles. On exposure to the air the coal loses moisture rapidly and checks or disintegrates into small irregular bits. The sample probably represented coal still within the weathered portion of the bed. In 1908 the coal was mined for local use.

For chemical analyses of this coal, see part I of this bulletin, p. 128; also, U. S. Geol. Survey Bull. 381, p. 105.

For geologic relations, see U. S. Geol. Survey Bull. 381, p. 85.

HARLEM. McDANIELS MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6315 (p. 129).

Mine.—McDaniels; Harlem district; in the unsurveyed SW. ¼ sec. 9, T. 33 N., R. 22 E., 10 miles northwest of Harlem.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in McDaniels mine, 10 miles northwest of Harlem.

Laboratory No.	6315	
Roof, shale.	*Ft.*	*in.*
Coal	1	1
Bone[a]	0	5½
Coal	1	0
Floor, bone.		
Thickness of bed	2	6½
Thickness of coal sampled	2	1

[a] Not included in sample.

The sample was taken about 175 feet from the mouth of the entry.

Notes.—The coal is noncoking. The sample has a dull black luster; it probably represented coal within the weathered portion of the bed. The coal in 1908 was mined for local use.

For chemical analyses of this coal, see part I of this bulletin, p. 129; also, U. S. Geol. Survey Bull. 381, p. 105.

For geologic relations, see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. ALCOTT MINE.

Sample.—Subbituminous coal; Milk River field; analyses Nos. 6474, 6801 (p. 129)

Mine.—Alcott; Havre district; in the NW. ¼ SW. ¼ sec. 29, T. 33 N., R. 16 E., 1½ miles north of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by L. J. Pepperberg in 1908, as shown below:

Section of coal bed in Alcott mine, 1½ miles north of Havre.

Laboratory No	6474		6801	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale, carbonaceous.				
Coal, with thin bone seams[a]	0	5	..	..
Bone	[a]0	¼	..	..
Coal	0	6	[a]0	6
Bone	[a]0	1½	0	2
Coal	[a]0	8	2	0
Bone	[a]0	10	[a]1	6
Coal	2	2½	1	0
Floor, bone, with thin coaly layers.				
Thickness of bed	4	9¼	5	2
Thickness of coal sampled	3	1½	3	2

[a] Not included in sample.

Sample 6474 was taken at the breast of the workings, about 120 feet from the mouth of the entry.

Sample 6801 was taken about 100 feet from the mine entrance.

Notes.—The coal, a "black lignite," has a bright luster, dark-brown streak, and semiconchoidal fracture. On exposure to the air it loses moisture rapidly and checks or disintegrates into irregular bits. In all probability, fresh unweathered coal had not been encountered in the workings at the time the sample was taken. The coal was being mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. HAVRE MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6479 (p. 129).

Mine.—Havre; Havre district; in the NW. ¼ sec. 31, T. 33, R. 16 E., 1½ miles northwest of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness variable; lies almost flat.

The bed was measured by V. H. Barnett in 1908, as shown below:

Section of coal bed in the Havre mine, 1½ miles northwest of Havre.

Laboratory No	6479	
	Ft.	*in.*
Roof, bone.		
Bone[a]	0	2
Coal	0	9
Bone[a]	1	4
Coal	2	6
Bone[a]	0	6
Coal[a]	0	6
Floor, bone.		
Thickness of bed	5	9
Thickness of coal sampled	2	6

[a] Not included in sample.

The sample was taken in a room in the east workings, 565 feet from the mouth of the entry under about 75 feet of cover.

Notes.—The coal is subbituminous, noncoking; has a bright black luster, dark-brown streak, and semiconchoidal fracture. Well-developed joint planes intersect almost at right angles. On exposure to air the coal loses moisture rapidly and checks or disintegrates into small irregular bits. The sample represented fairly unaltered coal. The underground workings in mine were about 2 miles in extent in 1908. The tipple is located on a spur of the Great Northern Railway connecting with the main line at Havre, Mont. The capacity in 1908 was 175 tons per day. The coal was mined mostly for local use. A few carload shipments had been made to Seattle and Spokane, Wash., and to Helena, Great Falls, and Conrad, Mont.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. KINNEY MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6475 (p. 129).

Mine.—Kinney; Havre district; in the SW. ¼ NE. ¼ sec. 26, T. 33, R. 15 E., 3½ miles northwest of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett on August 28, 1908, as shown below:

Section of coal bed in Kinney mine, 3½ miles northwest of Havre.

Laboratory No	6475	
	Ft.	*in.*
Roof, coal.		
Coal	1	8
Bone [a]	1	0
Coal	0	10
Floor, carbonaceous shale.		
Thickness of bed	3	6
Thickness of coal sampled	2	6

[a] Not included in sample.

The sample was taken at the breast of the workings about 200 feet from the mouth of the entry.

Notes.—The coal is noncoking and much like that from some other mines and prospects in the district. The workings had not penetrated beyond the weathered portion of the bed. The coal in 1908 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. ELECTRIC MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6473 (p. 129).

Mine.—Electric; Havre district; in the SW. ¼ sec. 29, T. 32 N., R. 16 E., 4 miles southwest of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable; dip, 10° S., 40° W., due to several small faults in the immediate vicinity.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Electric mine, 4 miles southwest of Havre.

Laboratory No	6473	
	Ft.	*in.*
Roof, shale.		
Coal	1	10
Bone [a]	1	2
Coal	1	8
Floor, shale.		
Thickness of bed	4	8
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken at the breast of the workings about 125 feet from the mouth of the entry.

Notes.—The coal is "black lignite" much like that from some other openings in the district. The sample probably represented coal within the weathered portion of the bed. The coal in 1908 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 6476 (p. 129).

Location.—Prospect on Bull Hook Creek, Havre district; in the SW. ¼ SW. ¼ sec. 36, T. 32 N., R. 16 E, 4 miles southeast of Havre. No railroad connection.

Coal bed.—No name. Cretaceous age, Judith River formation. The bed was measured and sampled in 1908 by L. J. Pepperberg.

The coal bed is 7 inches thick. The coal is metamorphosed by an intrusion of igneous rock.

For chemical analyses of this coal, see part I of this bulletin, p. 129.

HAVRE. BROWN MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6477 (p. 129).

Mine.—Brown (not worked); Havre district; in the SE. ¼ NE. ¼ sec. 21, T. 32 N., R. 17 E., 7 miles east of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Brown mine, 7 miles east of Havre.

Laboratory No	6477
Roof, sandy shale.	*Ft. in*
Coal	1 2
Bone [a]	0 3
Coal	3 4
Bone [a]	0 2
Coal	0 5
Floor, shale.	
Thickness of bed	5 4
Thickness of coal sampled	4 11

[a] Not included in sample.

The sample was taken about 65 feet from the mouth of the entry.

Notes.—The coal is noncoking and much like that from some other mines and prospects in the district. The sample probably represented coal within the weathered portion of the bed. The coal was mined for local use.

For chemical analyses of this coal, see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. BARROTT'S MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6548 (p. 129).

Mine.—Barrott's; Havre district; in the SW. ¼ sec. 29, T. 33 N., R. 15 E., 7 miles northwest of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Cretaceous age. The thickness is fairly uniform within the workings, dipping 8° NE.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Barrott's mine, 7 miles northwest of Havre.

Laboratory No	6548	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal [a]	0	2
Bone [a]	0	7
Coal	3	3
Thickness of bed	4	0
Thickness of coal sampled	3	3

[a] Not included in sample.

The sample was taken at the breast of the workings, about 250 feet from the mouth of the entry.

Notes.—The coal, a "black lignite," has a bright-black luster and semiconchoidal fracture. The bed has well developed joints that intersect almost at right angles. On exposure to the air the coal checks. In 1908 the workings had not penetrated beyond the weathered portion of the bed. The coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 85.

HAVRE. STATON'S MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6478 (p. 129).

Mine.—Staton's; Havre district; in the NE. ¼ sec. 4, T. 31 N., R. 17 E., 8 miles southeast of Havre.

Coal bed.—The coal is in the upper part of the Judith River formation, Montana group; Upper Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Staton's mine, 8 miles southeast of Havre.

Laboratory No	6478	
Roof, coal.	*Ft.*	*in.*
Coal	3	1
Bony coal [a]	0	10
Coal	1	10½
Floor, carbonaceous shale.		
Thickness of bed	5	9½
Thickness of coal sampled	4	11½

[a] Not included in sample.

The sample was taken about 250 feet from the mouth of the entry.

Notes.—The coal is subbituminous, "black lignite," has a bright black luster, dark-brown streak, and semiconchoidal fracture, two sets of joints intersect almost at right angles. On exposure to the air the coal loses moisture rapidly, and checks or disintegrates into small irregular bits. In 1908 the coal was mined for local use. A few carloads had been shipped to Helena and Great Falls, Mont.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

HAVRE. CLACK MINE.

Sample.—Subbituminous coal; Milk River field; analysis No. 6640 (p. 129).

Mine.—Clack. In the Havre district; in the SE. ¼ NE. ¼ sec. 5, T. 31 N., R. 17 E., 8½ miles southeast of Havre.

Coal bed.—Within the upper part of the Judith River formation, Montana group; Upper Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett on October 10, 1908, as shown below:

Section of coal bed in Clack mine, 8½ miles southeast of Havre.

Laboratory No.	6640	
Roof, bone coal.	*Ft.*	*in.*
Coal	2	8
Bone [a]	1	0
Coal	1	6
Floor, shale and bone.		
Thickness of bed	5	2
Thickness of coal sampled	4	2

[a] Not included in sample.

The sample was taken in room about 205 feet south and 15° west of the mouth of the entry.

Notes.—The coal is "black lignite," has a bright-black luster, dark-brown streak, semiconchoidal fracture. On exposure to the air it checks. The sample collected probably represented coal that was practically unaltered. The coal in 1908 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104.

HAVRE. SCHEAN PROSPECT.

Sample.—Subbituminous coal; Milk River field; analysis No. 6549 (p. 129).

Location.—Schean prospect. In the Havre district; in the SE. ¼ NE. ¼ sec. 28, T. 33 N., R. 14 E., 12 miles northwest of Havre.

Coal bed.—Within the upper part of the Judith formation, Montana group; Cretaceous age. Thickness, variable.

The bed was measured and sampled by V. H. Barnett in 1908, as shown below:

Section of coal bed in Schean prospect, 12 miles northwest of Havre.

Laboratory No.	6549	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal	3	0
Bone and clay [a]	1	5
Coal	0	4
Floor, bone.		
Thickness of bed	4	9
Thickness of coal sampled	3	4

[a] Not included in sample.

The sample was taken at the breast of the workings about 75 feet from the mouth of the entry.

Notes.—The coal, "black lignite," that in the main bench has a bright-black luster, is solid, and has a semiconchoidal fracture. On exposure to the air the coal checks. At the time of sampling, the face of the prospect in all probability was within the weathered portion of the bed. The coal was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 381, p. 104

CUSTER COUNTY.

FALLON. GIFFORD MINE.

Sample.—Subbituminous (?) coal; Miles City field; analysis No. 2426 (p. 129).

Mine.—Gifford; in T. 13 N., R. 52 E., near Fallon, on the bank of the Yellowstone River. No railroad connection.

Coal bed.—No name. Cretaceous or Tertiary age, Lance formation.

The bed was measured and sampled in 1905 by A. G. Leonard. The sample represented 4 feet 8 inches of clear coal. The sample was taken from the outcrop. It was wet with rain.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 316, p. 205.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 203.

FALLON. PROSPECT.

Sample.—Subbituminous (?) coal; Miles City field; analysis No. 2429 (p. 129).

Location.—A prospect on the west bank of the Yellowstone River at the mouth of Cottonwood Creek, in T. 13 N., R. 52 E., near Fallon. No railroad connection.

Coal bed.—No name. Cretaceous or Tertiary age, Lance formation.

The bed was measured and sampled by A. G. Leonard in 1905. The coal bed, measured at the outcrop, is 6 feet 4 inches thick. The sample was from a cut representing the entire thickness of the bed. The coal was fresh.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 316, p. 205.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 203.

MILES. HEDGES MINE.

Sample.—Subbituminous coal; Miles City field; analysis No. 5783 (p. 129).

Mine.—Hedges; opening on river bank, in sec. 22, T. 8 N., R. 47 E., 1 mile north of Miles.

Coal bed.—Kircher. Cretaceous or Tertiary age, Lance formation. The bed is about 5 feet 8½ inches thick.

The bed was measured and sampled by A. J. Collier and C. D. Smith in 1907, as shown below:

Section of coal bed in Hedges mine, 1 mile north of Miles.

Laboratory No	5783	
	Ft.	*in.*
Coal	0	7¼
Clay [a]	0	¾
Coal	1	9½
Clay [a]	1	9
Coal	1	6
Thickness of bed	5	8½
Thickness of coal sampled	3	10¾

[a] Not included in sample.

The sample was taken 150 feet from the mouth of the entry.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 39.

MILES. KIRCHER MINE.

Sample.—Subbituminous coal; Miles City field; analyses Nos. 2425, 5964 (p. 129).

Mine.—Kircher, in the SE. ¼ sec. 19, T. 8 N., R. 48 E., 5 miles northeast of Miles. No railroad connection.

Coal bed.—Kircher. Cretaceous or Tertiary age, Lance formation. At the mine the bed is about 14 feet 5 inches thick and is 60 feet below surface.

The bed was measured and sampled by A. G. Leonard in 1905, and by A. J. Collier in 1907, as described below:

Section of coal bed in Kircher mine, 5 miles northeast of Miles.

Laboratory No	5964	
	Ft.	*in.*
Coal[a]	1	0
Shale[a]	6	0
Coal[a]	0	4
Shale[a]	2	0
Coal	2	6
Bone[a]	0	1
Coal	2	6
Thickness of bed	14	5
Thickness of coal sampled	5	0

[a] Not included in sample.

Sample 2425 represented 4 feet 4 inches of coal.

Sample 2425 was taken 200 feet from the entrance of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 129; also U. S. Geol. Survey Bull. 316, p. 205; Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 39.

MILES. OLD WEAVER MINE.

Sample.—Subbituminous coal; Miles City field; analysis No. 3701 (p. 130).

Mine.—Old Weaver; 5 miles southeast of Miles, in the SE. ¼ sec. 6, T. 7 N., R. 48 E., near Signal Butte.

Coal bed.—Weaver. Cretaceous or Tertiary age, Lance formation. Thickness about 4 feet 11 inches; roof and floor, clay.

The bed was measured and sampled in 1907 by A. G. Leonard, as shown below:

Section of coal bed in Old Weaver mine, 5 miles southeast of Miles.

Laboratory No	3701	
Roof, brown, carbonaceous clay.	*Ft.*	*in.*
Coal	2	2
Clay[a]	0	1
Coal	0	2
Clay[a]	0	3
Coal	1	5
Clay, carbonaceous[a]	0	4
Coal	1	2
Floor, clay.		
Thickness of bed	5	7
Thickness of coal sampled	4	11

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 316, p. 205; Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 39.

MILES. WEAVER MINE.

Sample.—Subbituminous coal; Miles City field; analysis No. 5780 (p. 130).

Mine.—Weaver; on the west bank of Tongue River, on the Fort Keogh Military Reservation, about 6 miles south of Miles, in sec. 25, T. 7 N., R. 47 E.

Coal bed.—Kircher. Cretaceous or Tertiary age, Lance formation. Its thickness is extremely variable, as are roof and floor. It lies flat.

The bed was measured and sampled in 1907 by C. H. Wegemann, as shown below:

Section of coal bed in Weaver mine, 6 miles south of Miles.

Laboratory No.	5780	
	Ft.	*in.*
Coal, bony[a]	0	9
Coal	2	11½
Bone[a]	0	1½
Coal	0	4
Thickness of bed	4	2½
Thickness of coal sampled	3	3½

[a] Not included in sample.

The sample was taken 150 feet from shaft bottom.

Notes.—The coal is mined from a short drift. It is termed subbituminous; is tough when freshly mined, but soon crumbles or slacks on exposure. In 1907 it was used locally to some extent for steam production, but its greatest use was for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 130.

MILES. OUTCROP.

Sample.—Lignite; Miles City field; analysis No. 5962 (p. 130).

Location.—Outcrop; 19 miles east of Miles, in sec. 3, T. 7 N., R. 50 E.

Coal bed.—Dominy. Tertiary age, Fort Union formation. At the mine the bed is about 29 feet 2 inches thick, of which the lower 5 feet was sampled.

The bed was measured and sampled by A. J. Collier and C. D. Smith in 1907, as shown below:

Section of lignite bed, 19 miles east of Miles.

Laboratory No.	5962	
	Ft.	*in.*
Lignite[a]	7	0
Shale, sandy[a]	13	0
Lignite[a]	3	6
Shale, sandy[a]	0	8
Lignite	5	0
Thickness of bed	29	2
Thickness of coal sampled	5	0

[a] Not included in sample.

The sample was collected near the outcrop where the lignite showed some indications of weathering.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 39.

MILES. SMITH MINE.

Sample.—Subbituminous coal; Miles City field; analysis No. 5963 (p. 130.)

Mine.—Smith; 25 miles east of Miles, on the left bank of Powder River, sec. 2, T. 7 N., R. 51 E.

Coal bed.—Kircher. Cretaceous or Tertiary age, Lance formation. At the mine the bed is about 3 feet 9 inches thick.

The bed was measured and sampled in 1907 by C. D. Smith and A. J. Collier, as shown below:

Section of coal bed in Smith mine, 25 miles east of Miles.

Laboratory No	5963	
	Ft.	*in.*
Coal	1	11
Bone parting [a]	0	¾
Coal	1	10
Thickness of bed	3	9¾
Thickness of coal sampled	3	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 341, p. 59.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 341, p. 39.

MILES. ROBERTS PROSPECT.

Sample.—Lignite; Miles City field; analysis No. 3782 (p. 130).

Location.—Roberts prospect; at the head of Youall Creek in sec. 20, T. 12 N., R. 45 E., 30 miles northwest of Miles. No railroad connection.

Coal bed.—No name. Tertiary age, Fort Union formation.

The bed was measured and sampled on September 8, 1906, by A. G. Leonard, as shown below:

Section of coal bed in Roberts prospect, 30 miles northwest of Miles.

Laboratory No	3782	
	Ft.	*in.*
Coal	4	0
Coal [a]	6	0
Thickness of bed	10	0
Thickness of coal sampled	4	0

[a] Not included in sample.

The sample was cut from the upper part of the outcrop; the lower part of the outcrop was not exposed.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 316, p. 205.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 205.

MILES. PROSPECT.

Sample.—Lignite; Miles City field; analysis No. 3783 (p. 130).

Location.—A prospect; at the head of Crow Rock Creek in T. 12 N., R. 45 E., 35 miles northwest of Miles. No railroad connection.

Coal bed.—No name. Tertiary age, Fort Union formation.

The bed was measured and sampled on September 10, 1906, by A. G. Leonard The sample was composed of pieces of coal selected from the middle of the bed at the outcrop, the pieces being from a thickness of 8 feet 9 inches.

For chemical analyses of this coal see part I of this bulletin, p. 130; also U. S. Geol. Survey Bull. 316, p. 205.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 316, p. 208.

DAWSON COUNTY.

GLENDIVE. SNYDER MINE.

Sample.—Lignite; analyses Nos. 2423, 3812, 3815, 3816, 3817, 3819, 3820 (p. 130).

Mine.—Snyder; 8 miles north of Glendive, in the NW. ¼ sec. 27, T. 17 N., R. 55 E. No railroad connection.

Coal bed.—No name. Tertiary age, Fort Union formation.

The bed was measured and sampled in 1905 by A. G. Leonard.

Sample 2423 was taken 240 feet from the entrance of the mine and represented 6½ feet of clear coal.

The lignite in this mine was also sampled on September 17, 1906, by J. A. Holmes.

Sample 3812 represented the whole bed, being taken from a 6¾-foot cut.

Sample 3815 represented 6½ feet of weathered coal, and was taken at the drift entrance.

Sample 3816 was taken at the head of the drift, south of the entrance. It represented 6½ feet of coal.

Sample 3817 was taken 100 feet from the entrance to the mine.

Sample 3819 was taken from the main entry, 200 feet from mine mouth.

Sample 3820 was taken from the main entry, 25 feet from mine mouth.

Note.—In 1905 the town of Glendive was supplied with fuel from this mine.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 316, p. 205.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull 285, p. 328.

GLENDIVE. OUTCROP.

Sample.—Lignite; analysis No. 2424 (p. 131).

Location.—Surface outcrop on Clear Creek, 12 miles southwest of Glendive, in sec. 10, T. 14 N., R. 54 E. No railroad connection.

Coal bed.—No name. Tertiary age, Fort Union formation. The bed is about 4½ feet thick at the point of sampling, and lies nearly flat.

The bed was measured and sampled in 1905 by A. G. Leonard, as shown below:

Section of coal bed in outcrop, 12 miles southwest of Glendive.

Laboratory No.	2424	
	Ft.	*in.*
Coal [a]	0	6
Coal	4	0
Thickness of bed	4	6
Thickness of coal sampled	4	0

[a] Not included in the sample.

The sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 316, p. 205.

JORDAN. OUTCROP.

Sample.—Lignite; analysis No. 3842 (p. 131).

Location.—Surface outcrop; at Jordan, on Big Dry Creek, 91 miles northwest of Miles, T. 18 N., R. 39 E. No railroad connection.

Coal bed.—No name. Tertiary age, Fort Union formation. The bed is 6 feet 4 inches thick, with partings at the point sampled. It lies flat.

The bed was measured and sampled on September 15, 1906, by A. G. Leonard, as shown below:

Section of coal bed in outcrop at Jordan.

Laboratory No	3842	
	Ft.	*in.*
Coal [a]	1	9
Shale [a]	0	6
Coal	2	2
Bone [a]	0	2
Coal	1	8
Thickness of bed	6	3
Thickness of coal sampled	3	7

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 316, p. 205.

FERGUS COUNTY.

BUFFALO. WILLIAMS MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5265 (p. 131).

Mine.—Williams, in the Buffalo Creek district; a slope mine, 7½ miles southwest of Buffalo, and 4 miles east of Greene, in the NE. ¼ NE. ¼ sec. 20, T. 12 N., R. 14 E.

Coal bed.—The coal is of Lower Cretaceous age, Kootenai formation. The thickness of the bed is uniform, being about 30 inches. The dip at entry mouth is slight, but increases to about 14° within 1,000 feet. Roof, shale; floor, sandstone.

The bed was measured and sampled by W. R. Calvert in 1907. The sample represented 2 feet 6 inches of coal. It was taken from the face of the entry, 165 feet from the entrance.

Notes.—The coal is bituminous, noncoking. In 1907 it was used locally, and mined chiefly in the fall and winter. The entry was in 165 feet at the time of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 390, p. 74; Bull. 341, p. 120.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 56.

BUFFALO. SAAGER CANYON MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5267 (p. 131).

Mine.—Saager Canyon; Buffalo Creek district; a slope mine 8 miles southwest of Buffalo, in the NW. ¼ NW. ¼ sec. 28, T. 12 N., R. 14 E.

Coal bed.—The coal is of Lower Cretaceous age, Kootenai formation. Thickness, uniform, 4 feet. Roof, shale; floor, sandstone. Dip, 4° N. Cover, 0 to 100 feet. It is the sole workable bed in the field.

The bed was measured and sampled by W. R. Calvert in 1907. The sample represented 4 feet of clear coal. It was taken from entry face, 85 feet from the mine entrance.

Notes.—The mine was opened a short time prior to examination. The coal was used locally and only a small amount had been mined.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 56.

FOREST GROVE. HOBSON MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5295 (p. 131).

Mine.—Hobson; 1½ miles west of Forest Grove, in the SW. ¼ SE. ¼ sec. 1, T. 14 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of Lower Cretaceous age. The dip is slight, to the north. The maximum cover is 50 feet.

The bed was measured and sampled by Eugene Stebinger in 1907, as shown below:

Section of coal bed in Hobson mine, 1½ miles west of Forest Grove.

Laboratory No	5295	
Roof, sandstone.	*Ft.*	*in.*
Coal	2	10
Bone[a]	0	2
Coal	0	7
Floor, shale.		
Thickness of bed	3	7
Thickness of coal sampled	3	5

[a] Not included in sample.

The sample was taken 140 feet from the mine entrance.

Notes.—The coal is bituminous, noncoking. In 1907 it was mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 390, p. 74.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 56.

FOREST GROVE. BEN HILL MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5294 (p. 131).

Mine.—Ben Hill mine; 4 miles northwest of Forest Grove, in the SE. ¼ NW. ¼ sec. 35, T. 15 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of Lower Cretaceous age. The bed has two benches, the upper of which is too impure to be saved in mining. The dip is slight, to the north. The cover is about 50 feet.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Ben Hill mine, 4 miles northwest of Forest Grove.

Laboratory No	5294	
Roof, sandstone.	*Ft.*	*in.*
Coal, impure[a]	1	2
Clay[a]	0	¾
Coal	2	4
Floor, clay.		
Thickness of bed	3	6¾
Thickness of coal sampled	2	4

[a] Nor included in sample.

The sample was taken from the face of the entry, 140 feet from the mine entrance.

Notes.—The coal is bituminous, noncoking. In 1907 it was mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 390, p. 74; Bull. 341, p. 120.

GILTEDGE. SHERMAN MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5473 (p. 131).

Mine.—Sherman; north face of Flat Mountain, 2 miles southwest of Giltedge, in sec. 33, T. 16 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation (Lower Cretaceous age) in this field. The thickness is fairly uniform. The dip is 14° S. The cover is 50 to 100 feet thick.

The bed was measured and sampled by E. Stebinger in 1907, as shown below:

Section of coal bed in Sherman mine, 2 miles southwest of Giltedge.

Laboratory No.	5473	
Roof, bone.	*Ft.*	*in.*
Coal	0	6
Bone[a]	0	5
Coal	2	2
Clay[a]	0	1
Coal	0	7
Floor, clay.		
Thickness of bed	3	9
Thickness of coal sampled	3	3

[a] Not included in sample.

The sample was taken from face of entry, 300 feet in.

Note.—Coal is bituminous, noncoking, and in 1907 was mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 341, p. 121; Bull 390, p. 75.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 68.

GILTEDGE. SHIPLEY MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5474 (p. 131).

Mine.—Shipley; 2½ miles southeast of Giltedge, in the SE. ¼ SE. ¼ sec. 33, T. 16 N., R. 20 E.

Coal bed.—The bed is of Lower Cretaceous age, Kootenai formation.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Shipley mine, 2½ miles southeast of Giltedge.

Laboratory No.	5474	
Roof, clay.	*Ft.*	*in.*
Carbonaceous shale[a]	0	4
Coal	0	10
Clay[a]	0	1
Coal	0	9
Floor, clay.		
Thickness of bed	2	0
Thickness of coal sampled	1	7

[a] Not included in sample.

The sample was taken from the face of the entry, about 100 feet from the mine entrance.

Notes.—A small quantity of coal had been mined previous to 1904. The mine was not being worked at the time of sampling in 1907.

For chemical analyses of this coal, see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 341, p. 121.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 390, p. 56.

GILTEDGE. CLIFFE MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5476 (p. 131).

Mine.—Cliffe; 3½ miles southeast of Giltedge, in the NE. ¼ NW. ¼ sec. 3, T. 15 N., R. 20 E.

Coal bed.—The bed is the sole workable of the Kootenai formation in this field. It is of Lower Cretaceous age. Dip, 15°. Cover, 50 to 100 feet.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Cliffe mine, 3½ miles southeast of Giltedge.

Laboratory No	5476	
Roof, clay shale.	*Ft.*	*in.*
Coal	2	3
Clay [a]	0	1
Coal	0	6
Floor, clay.		
Thickness of bed	2	10
Thickness of coal sampled	2	9

[a] Not included in sample.

The sample was taken from the face of the main entry, 700 feet in.

Note.—The coal is bituminous, noncoking. In 1907 it was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 390, p. 75; Bull. 341, p. 121.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 390, p. 56.

GILTEDGE. GOLD REEF MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5471 (p. 131).

Mine.—Gold Reef; 4 miles south of Giltedge, in the NW. ¼ NE. ¼ sec. 9, T. 15 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is Lower Cretaceous in age. Dip, 17°. Cover, 25 to 100 feet.

The bed was measured and sampled in 1907 by W. R. Calvert, as shown below:

Section of coal bed in Gold Reef mine, 4 miles south of Giltedge.

Laboratory No	5471	
Roof, clay and bone.	*Ft.*	*in.*
Coal	2	3
Clay [a]	0	1
Coal	0	8
Floor, clay.		
Thickness of bed	3	0
Thickness of coal sampled	2	11

[a] Not included in sample.

The sample was taken from the face of the entry, 300 feet from the mine entrance.

Note.—The coal is bituminous, noncoking.

For chemical analyses of this coal, see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 390, p. 75; Bull. 341, p. 121.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 390, p. 56.

LEWISTOWN. SPRING CREEK MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5272 (p. 131).

Mine.—Spring Creek; in the NW. ¼ NW. ¼ sec. 26, T. 15 N., R. 18 E., 2 miles southeast of Lewistown.

Coal bed.—The bed is the sole worked bed in the field. It is of Lower Cretaceous age, Kootenai formation. The thickness is fairly uniform, there being 36 inches of coal in a carbonaceous zone 58 inches thick. The dip is 3° to 5° NW. The roof is gritty shale; the floor is clay. The cover is 20 to 200 feet thick.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Spring Creek mine, 2 miles southeast of Lewistown.

Laboratory No	5272
Roof, gritty shale.	*Ft. in.*
Coal	2 2
Bone [a]	0 6
Coal	0 10
Bone [a]	1 4
Floor, clay.	
Thickness of bed	4 10
Thickness of coal sampled	3 0

[a] Not included in sample.

The sample was taken from the face of room 2, off south entry 1.

Notes.—In 1907 the coal from this mine was used almost exclusively by the Montana Railway, which used about 125 tons a day. A small amount was sold for local use at Lewistown. The coal is noncoking.

For chemical analyses of this coal, see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For a description of the geologic relations of the coal bed, see U. S. Geol. Survey Bull. 390, p. 56.

Lewistown. Brew & Parson Mine.

Sample.—Bituminous coal; Lewistown field; analysis No. 5291 (p. 131).

Mine.—Brew & Parson; 4½ miles northeast of Lewistown, in the NE. ¼ SW. ¼ sec. 32, T. 16 N., R. 19 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of Lower Cretaceous age. The bed has two benches, both of variable thickness. The upper bench is jointed, but the lower has no cleavage planes.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Brew & Parson mine, 4½ miles northeast of Lewistown.

Laboratory No	5291
Roof, clay shale.	*Ft. in.*
Bone (varying up to 6 inches) [a]	0 4
Coal	3 2
Shale (varying up to 12 inches) [a]	0 2
Coal	2 6
Floor, clay.	
Thickness of bed	6 2
Thickness of coal sampled	5 8

[a] Not included in sample.

The sample was taken from the face of east entry 1, 300 feet in.

Note.—The coal is noncoking.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. . Geol. Survey Bull. 341, p. 121; Bull. 390, p. 75.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 69.

Lewistown. Sharp Mine.

Sample.—Bituminous coal; Lewistown field; analysis No. 5293 (p. 131).

Mine.—Sharp; 7½ miles east of Lewistown in the NW. ¼ NW. ¼ sec. 13, T. 15 N., R. 19 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of Lower Cretaceous age. The thickness is uniform; the dip 6° E. Maximum cover is not over 30 feet.

The bed was measured and sampled by W. R. Calvert, as shown below:

Section of coal bed in Sharp mine, 7½ miles east of Lewistown.

Laboratory No	5293	
Roof, shale.	*Ft.*	*in.*
Bone[a]	0	8
Coal	2	4
Shale[a]	0	1
Coal	0	5
Floor, clay.		
Thickness of bed	3	6
Thickness of coal sampled	2	9

[a] Not included in sample.

The sample was taken from entry face, 90 feet in.

Note.—The coal is bituminous, noncoking, and in 1907 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 131; also U. S. Geol. Survey Bull. 341, p. 121; Bull. 390, p. 75.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 390, p. 66.

LEWISTOWN. HAMILTON MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5296 (p. 132).

Mine.—Hamilton; 8 miles east of Lewistown, near the center of sec. 24, T. 15 N., R. 19 E.

Coal bed.—Not named. The sole workable bed of the Kootenai formation (Lower Cretaceous age) in this field. The dip is about 10°. The cover is light.

The bed was measured and sampled by E. Stebinger and J. B. Umpleby in 1907, as shown below:

Section of coal bed in Hamilton mine, 8 miles east of Lewistown.

Laboratory No	5296	
Roof, bone.	*Ft.*	*in.*
Coal	0	6
Bone[a]	1	1
Coal	3	10
Floor, clay.		
Thickness of bed	5	5
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken from face of entry, 450 feet in.

Note.—The coal is bituminous, noncoking, and in 1907 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 390, p. 75.

For geologic relations see U. S. Geol. Survey Bull. 390, p. 56.

LEWISTOWN. BLACK DIAMOND MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5292 (p. 132).

Mine.—Black Diamond; 8½ miles southwest of Lewistown, in the NW. ¼ NW. ¼ sec. 25, T. 15 N., R. 19 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation (Lower Cretaceous age) in this field. Its dip is slight; the cover is about 50 feet. The thickness is uniform, about 52 inches. The roof is bone, to which much of the coal is "frozen." The floor is clay.

The bed was measured and sampled in 1907 by E. Stebinger and J. B. Umpleby. The sample represented 4 feet 4 inches of clear coal. It was taken from the face of the fifth room on the left, 400 feet in.

For chemical analyses of this coal see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 390, p. 56.

LEWISTOWN. FLAHERTY MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5343 (p. 132).

Mine.—Flaherty; 9 miles east of Lewistown, in the NE. ¼ SW. ¼ sec. 18, T. 15 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of lower Cretaceous age. At this mine the thickness is variable, averaging about 46 inches of coal below a bone parting, which is usually left as a roof. The floor is clay. The dip is slight to the south. The cover is 50 to 100 feet.

The bed was measured and sampled by W. R. Calvert in 1907. The sample represented 3 feet 10 inches of coal. The sample was taken from the face of the right entry, 170 feet in.

Notes.—Coal is bituminous, noncoking, and in 1907 was mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 390, p. 75; Bull. 341, p. 121.

For geologic relations see U. S. Geol. Survey Bull. 390, p. 56.

LEWISTOWN. NEVIN MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5475 (p. 132).

Mine.—Nevin; 9 miles northeast of Lewistown, in the NE. ¼ SE. ¼ sec. 7, T. 16 N., R. 19 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. It is of Lower Cretaceous age. At this mine it dips 48°.

The bed was measured and sampled in 1907 by W. R. Calvert, as shown below:

Section of coal bed in Nevin mine, 9 miles northeast of Lewistown.

Laboratory No.	5475	
Roof, clay shale.	*Ft.*	*in.*
Carbonaceous shale[a]	0	7
Coal, dirty	2	6
Bone	0	3
Floor, sandstone.		
Thickness of bed	3	4
Thickness of coal sampled	2	6

[a] Not included in sample.

The sample was taken from face of entry, 600 feet in.

Notes.—Coal is noncoking; much crushed and dirty. The carbonaceous shale shown in the section is a mixture of coal and shale resulting from crushing. It was generally separated in mining if possible.

For chemical analyses see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 121; Bull. 390, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 390, p. 56.

LEWISTOWN. PEIPER MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5289 (p. 132).

Mine.—Peiper, 9 miles southeast of Lewistown, in the SW. ¼ NE. ¼ sec. 6, T. 14 N., R. 20 E.

Coal bed.—The bed is the sole workable bed of the Kootenai formation in this field. Lower Cretaceous age. Dip, 13° N. Roof, shale; floor, clay.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Peiper mine, 9 miles southeast of Lewistown.

Laboratory No	5289	
Roof, shale.	*Ft.*	*in.*
Coal	2	10
Bone [a]	1	0
Floor, clay.		
Thickness of bed	3	10
Thickness of coal sampled	2	10

[a] Not included in sample.

The sample was taken from the face of the entry, 315 feet from the mine entrance.

Notes.—The coal is bituminous, noncoking. In 1907 it was mined for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 390, p. 56.

MAIDEN. MACE MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5472 (p. 132).

Mine.—Mace; a slope mine 5 miles northwest of Maiden on Warm Spring Creek, in the SW. ¼ NW. ¼ sec. 32, T. 17 N., R. 19 E.

Coal bed.—Not named. The sole workable bed of the Kootenai formation (Lower Cretaceous age) in this field. At this mine the roof is clay and the floor is sandstone. The thickness of the bed varies, averaging 4 feet. The dip is 3° to 9° S. The cover is 50 to 400 feet.

The bed was measured and sampled by W. R. Calvert in 1907, as shown below:

Section of coal bed in Mace mine, 5 miles northwest of Maiden.

Laboratory No	5472	
Roof, clay.	*Ft.*	*in.*
Coal	1	2
Bone [a]	0	4
Coal	2	5
Bone [a]	0	5
Floor, sandstone.		
Thickness of bed	4	4
Thickness of coal sampled	3	7

[a] Not included in sample.

The sample was taken from entry face, 500 feet from the mine entrance.

Notes.—At this mine the coal is fairly clean, but contains much sulphur in the form of pyrites. It is said to coke well if the sulphur is removed. In 1907 the coal was used locally and mined chiefly in the fall and winter.

For chemical analyses of this coal see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

MOORE. KNOX MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5274 (p. 132).

Mine.—Knox; a slope mine, 10 miles southeast of Moore, on Rock Creek, in the SW. ¼ SE. ¼ sec. 3, T. 13 N., R. 17 E.

Coal bed.—The sole workable bed of the Kootenai formation in this field. The bed has two benches that vary in thickness, but the thickness of the bed is uniform. The dip is slight to the north.

The bed was measured and sampled by Eug. Stebinger in 1907, as shown below:

Section of coal bed in Knox mine, 8 miles southeast of Moore.

Laboratory No.	5274	
Roof, fine-grained sandstone.	*Ft.*	*in.*
Coal	1	3
Bone[a]	1	0
Coal	1	2
Floor, shale.		
Thickness of bed	3	5
Thickness of coal sampled	2	5

[a] Not included in sample.

The sample was taken in the face of the entry, 250 feet from the mine entrance.

Notes.—In 1907 this coal was mined in small quantity for local use. It is bituminous, noncoking.

For chemical analyses of this coal, see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

MOORE. SHARP MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5266 (p. 132).

Mine.—Sharp; 9 miles southeast of Moore, on Rock Creek, in the SE. ¼ NE. ¼ sec. 16, T. 13 N., R. 17 E.

Coal bed.—Not named; Lower Cretaceous age; sole workable bed of the Kootenai formation in this field. Bed, uniform; dip, 3° N.; cover about 50 feet.

The bed was measured and sampled in 1907 by W. R. Calvert, as shown below:

Section of coal bed in Sharp mine, 9 miles southeast of Moore.

Laboratory No.	5266	
Roof, bone.	*Ft.*	*in.*
Coal	0	6
Shale[a]	0	1
Coal	3	0
Floor, clay.		
Thickness of bed	3	7
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken from the face of the entry, 300 feet from the mine entrance.

Notes.—The coal is bituminous, noncoking, and in 1907 was mined for local use. The lower 3 inches of the bottom bench is a blacksmithing coal, and is separated for that purpose.

For chemical analyses of this coal, see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations, see U. S. Geol. Survey Bull. 390, p. 56.

MOORE. COOPER MINE.

Sample.—Bituminous coal; Lewistown field; analysis No. 5264 (p. 132).

Mine.—Cooper; a slope mine, 9½ miles southeast of Moore, in the SE. ¼ NW. ¼ sec. 15, T. 13 N., R. 17 E.

Coal bed.—The bed is the sole workable bed of Lower Cretaceous age, Kootenai formation. Thickness, uniform, about 4 feet 3 inches; dip, slight; roof, sandstone; floor, clay.

The bed was measured and sampled in 1907 by W. R. Calvert, as shown below:

Section of coal bed in Cooper mine, 9½ miles southeast of Moore.

Laboratory No.	5264	
	Ft.	*in.*
Roof, sandstone.		
Coal	1	0
Bone [a]	1	0
Coal	2	2
Floor, clay.		
Thickness of bed	4	2
Thickness of coal sampled	3	2

[a] Not included in sample.

The sample was taken from the face of the main entry.

Notes.—There is usually less than 20 feet of cover, and the coal, especially the upper bench, is somewhat weathered; a large amount of waste results in mining. Coal was used locally; it is a noncoking coal.

For chemical analyses of this coal, see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations, see U. S. Geol. Survey Bull. 390, p. 24.

MOORE. RAND MINE.

Sample.—Bituminous (?) coal; Lewistown field; analysis No. 5273 (p. 132).

Mine.—Rand; a slope mine, 10 miles southeast of Moore, on Rock Creek, in the NW. ¼ SW. ¼ sec. 14, T. 13 N., R. 17 E.

Coal bed.—The bed is the sole workable bed of Kootenai formation, Lower Cretaceous age. Average thickness, 2 feet 6 inches; dip, verv slight; cover, usually less than 25 feet; roof, bone; floor, sandstone.

The bed was measured and sampled in 1907 by Eug. Stebinger. The sample represented 2 feet 6 inches of coal. It was taken 50 feet from the mine entrance.

Note.—The coal is soft and dirty; used locally.

For chemical analyses, see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations, see U. S. Geol. Survey Bull. 390. p. 56.

MUSSELSHELL. PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 6829 (p. 132).

Mine.—Prospect; about 7 miles northwest of Musselshell, in T. 9 N., R. 27 E.

Coal bed.—Homestaed. Tertiary age, Fort Union formation. Roof is of shale, 2 feet thick, with streaks of coal. The bed is 4 feet 5 inches thick.

The bed was measured and sampled in 1908 by R. W. Richards, as shown below:

Section of coal bed in prospect, 7 miles northwest of Musselshell.

Laboratory No.	6829	
	Ft.	*in.*
Roof, shale.		
Coal	1	3
Bone [b]	0	4
Coal [b]	0	4
Bone [b]	0	2
Coal [b]	0	3
Shale [b]	1	0
Coal	1	1
Thickness of bed	4	5
Thickness of coal sampled	2	4

[a] Now included in Musselshell County.

[b] Not included in sample.

The sample was taken 25 feet in.

For chemical analyses see part I of this bulletin, p. 132; also U. S. Geol. Survey Bull. 381, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

Roundup. Commercial Mine.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8801 (p. 133).

Mine.—Commercial; a slope mine 1 mile west of Roundup, in the NW. ¼ sec. 23, T. 8 N., R. 25 E., on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—The bed is of Tertiary age, Fort Union formation. Its thickness is uniform and it dips southwest about 5½°. The roof is a sandy gray shale. The underlying 5½ inches of bone is usually taken down with the coal. The floor is a resistant gray sandstone.

The bed was sampled and measured by C. T. Lupton on August 6, 1909, as shown below:

Section of coal bed in the Commercial mine at Roundup.

Laboratory No	8801
	Ft. in.
Main roof, gray sandstone.	
Shale, gray [a]	2 0
Bone [a]	0 5½
Coal	5 8
Floor, gray sandstone.	
Thickness of bed	6 1½
Thickness of coal sampled	5 8

[a] Not included in sample.

The sample was taken in room 25, off west entry 1, 900 feet from mine mouth.

Notes.—The coal from this mine is subbituminous and does not "stock" well. It is used mostly for heating and power purposes. It is reported that the coal can be coked. Lump, egg, nut, slack, run-of-mine, and combinations of all of these sizes are shipped. The output of the mine in 1909 was 1,000 tons daily.

For chemical analyses of this coal see part I of this bulletin, p. 133.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

Utica. Showan Mine.

Sample.—Bituminous coal; Lewistown field; analysis No. 5290 (p. 133).

Mine.—Showan; 2 miles west of Utica, in the NE. ¼ NE. ¼ sec. 24, T. 14 N., R. 12 E.

Coal bed.—Not named. Lower Cretaceous age. Sole workable bed of the Kootenai formation. Dip, slight, to south; cover, 50 feet or less.

The bed was measured and sampled in 1907 by W. R. Calvert, as shown below:

Section of coal bed in Showan mine, ½ mile west of Utica.

Laboratory No	5290
	Ft. in.
Roof, shale.	
Coal	1 6
Shale [a]	1 3
Coal, bony [a]	0 8
Shale [a]	0 11
Bone [a]	0 6
Coal	1 8
Floor, shale.	
Thickness of bed	6 6
Thickness of coal sampled	3 2

[a] Not included in sample.

The sample was taken from the face of entry, 100 feet in.

Note.—The coal at this opening is soft and contains much sulphur in the form of pyrite.

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[a] Now included in Musselshell County.

For chemical analyses of this coal see part I of this bulletin, p. 133; also U. S. Geol. Survey Bull. 341, p. 120; Bull. 390, p. 74.

For geologic relations see U. S Geol. Survey Bull. 390, p. 56.

WINDHAM. HUGHES MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3756 (p. 133).

Mine.—Hughes; 4½ miles southwest of Windham, on Hughes ranch, on the east side of Willow Creek, in the NE. ¼ sec. 19, T. 15 N., R. 12 E.

Coal bed.—The bed is of Lower Cretaceous age, Kootenai formation. The thickness of the bed is 6 feet, including three partings. A dark-colored shale forms the roof.

Section of coal bed in Hughes mine, 4½ miles southwest of Windham.

Laboratory No	3756	
Roof, dark shale.	*Ft.*	*in.*
Coal	2	0
Bone [a]	0	3
Coal	1	4
Coal, bony [a]	0	9
Coal	1	4
Clay [a]	0	2
Coal [a]	0	3
Thickness of bed	6	1
Thickness of coal sampled	4	8

[a] Not included in sample.

The sample was taken in the main entry, 250 feet from the mouth of the mine.

For chemical analyses see part I of this bulletin, p. 133; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 356, p. 50.

WINDHAM. SEMAN MINE.

Sample.—Bituminous coal; Great Falls field; analysis No. 3753 (p. 133).

Mine.—Seman; 5 miles southwest of Windham, in the SW. ¼ SE. ¼ sec. 20, T. 15 N., R. 12 E., on the west side of Spring Draw.

Coal bed.—The bed is of Lower Cretaceous age, Kootenai formation. It has a shale roof and a clay floor.

The bed was measured and sampled on August 24, 1906, by C. A. Fisher, as shown below:

Section of bed in Seman mine, 5½ miles southwest of Windham.

Laboratory No	3753	
Roof, shale.	*Ft.*	*In.*
Coal	1	3
Bone [a]	0	7
Coal	1	4
Bony coal [a]	0	9
Coal	2	0
Floor, clay.		
Thickness of bed	5	11
Thickness of coal sampled	4	7

[a] Not included in sample.

The sample was taken 400 feet from the mouth of the mine.

Note.—In 1906 the bed was not worked continuously; a few tons was kept on hand to supply a small local trade.

For chemical analyses of this coal see part I of this bulletin, p. 133; also U. S. Geol. Survey Bull. 316, p. 171; Bull. 356, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 356, p. 50.

GALLATIN COUNTY.

CHESTNUT. BEEDE AND BAILEY MINE.

Sample.—Bituminous coal; Livingston field; analysis No. 6621 (p. 133).

Mine.—Beede and Bailey; near Chestnut, in the SW. ¼ sec. 13, T. 2 S., R. 6 E.

Coal bed.—Top bed of Mesaverde (?) formation; Cretaceous age; thickness at this mine, variable; dip, 38° dip to north, which increases to 85° within one-half mile eastward.

The bed was measured and sampled in September, 1908, by W. R. Calvert. The sample represented 3 feet 2 inches of coal, over which was 1 foot 3 inches of shale overlain with sandstone.

The sample was taken at the tipple and represented run-of-mine coal.

Notes.—Coal soft and crushed; high-grade bituminous; not known to be coking. The mine is in a faulted area, so that its development may be uncertain. In 1908 an entry had been driven 175 feet. The coal was used for local use only.

For chemical analyses of this coal see part I of this bulletin, p. 133.

CHESTNUT. MOUNTAINSIDE MINE.

Sample.—Bituminous coal; Livingston field; analysis No. 3667 (p. 133).

Mine.—Mountainside: in sec. 21, T. 2 S., R. 7 E., near Chestnut.

Coal bed.—The bed is of Cretaceous age, Mesaverde (?) formation.

The bed was sampled by J. P. Rowe in 1906.

For chemical analyses of this coal see part I of this bulletin, p. 133.

CHESTNUT. HOFFMAN MINE.

Sample.—Bituminous coal; Trail Creek field; analysis Nos. 3813, 3814, 3818, 3821 (p. 133).

Mine.—Hoffman, 8 miles south of Chestnut.

Coal bed.—The bed is of Cretaceous age, Mesaverde (?) formation.

The bed was measured and sampled in 1906 by J. A. Holmes, as shown below:

Section of coal bed in Hoffman mine, 8 miles south of Chestnut.

Laboratory No.	3813		3814		3818	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3	..	..	..	..
Parting	[a]0	2	..	..	..	..
Coal	1	4	..	..	..	..
Parting	[a]0	1	..	..	..	..
Coal	0	9	..	..	3	0
Bone	[a]0	1	..	..	[a]0	8
Coal	4	6	[a]2	0	1	6
Coal	..	..	7	0	..	..
Thickness of bed	8	2	9	0	5	2
Thickness of coal sampled	7	10	7	0	4	6

[a] Not included in sample.

No section for laboratory No. 3821 is available.

Sample 3813 was taken in third entry, 800 feet west of foot of slope, 325 feet down.

Sample 3814 was taken at same point as 3813.

Sample 3818 was taken 1,200 feet in mine at head of west entry.

Sample 3821—location not stated.

For chemical analyses of this coal see part I of this bulletin, p. 133.

STORRS. ANACONDA MINE.

Sample.—Bituminous coal; Trail Creek field; analysis No. 3691 (p. 133).

Mine.—Anaconda; 3 miles southeast of Chestnut, at Storrs.

Coal bed.—The bed is of Cretaceous age, Mesaverde (?) formation.

The sample was taken by J. P. Rowe in 1906.

For chemical analyses of this coal see part I of this bulletin, p. 133.

STORRS. STORRS NO. 3 MINE.

Sample.—Bituminous coal; Trail Creek field (Denver No. 5); analyses Nos. 166–D, 167–D (p. 133).

Mine.—Storrs No. 3; at Storrs, on the Northern Pacific Railway.

Coal bed.—Locally known as the No. 2. Cretaceous age, Mesaverde (?) formation. Thickness, variable; dip, 45°; mine worked through a crosscut to the bed. Roof, shale, in places soft, in places mixed with coal and termed "rash"; floor, shale.

The bed was measured and sampled at two points by J. W. Groves in 1907, as shown below:

Sections of coal bed in Storrs No. 3 mine at Storrs.

Section	A		B	
Laboratory No.	166–D		167–D	
Roof, sec. A, rash and shale; sec. B, soft shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7	0	6
Rash [a]	0	7	..	..
Clay [a]	..	..	0	2
Coal	2	0	1	6
Rash [a]	0	2	2	0
Coal	1	0	3	2
Rash [a]	0	1	0	2
Coal	1	0	0	11
Shale [a]	0	1	..	..
Coal	0	5	..	..
Floor, shale.				
Thickness of bed	5	11	8	5
Thickness of coal sampled	5	0	6	1

[a] Not included in sample.

Section A (sample 166–D) was measured 4,600 feet north of the opening.

Section B (sample 167–D) was measured 4,000 feet north of the opening.

For results of tests of this coal see mention of specific tests as follows—washing tests: U. S. Geol. Survey Bull. 368, p. 27; coking tests: U. S. Geol. Survey Bull. 369, p. 40.

For chemical analyses see part I of this bulletin, p. 133; also U. S. Geol. Survey Bull. 368, p. 15.

STORRS. WASHOE NO. 1 (HODSON) MINE.

Sample.—Bituminous coal; Livingston field; analysis No. 6597 (p. 133).

Mine.—Washoe No. 1 (Hodson); in sec. 26, T. 2 S., R. 7 E., ½ mile east of Storrs.

Coal bed.—Top bed of Mesaverde (?) formation; Cretaceous age. Coal opened by a rock drift to tap bed; dip, 35°; entry turned to north 900 feet.

The bed was measured and sampled by W. R. Calvert in September, 1908, as shown below:

Section of coal bed in Washoe No. 1 mine, one-half mile east of Storrs.

Laboratory No.	6597	
Roof, sandstone.	*Ft.*	*in.*
Bone	0	5
Coal	2	3
Bone [a]	0	5
Coal	0	10
Floor, sandstone.		
Thickness of bed	4	1
Thickness of coal sampled	3	1

[a] Not included in sample.

The sample was taken from the face of pillar between rooms 1 and 2.

Notes.—The coal is coking, bituminous, but soft and badly crushed. The mine was once a large producer, but had been abandoned a year or so prior to 1908. It was then leased, and a renewal of its development was planned.

For chemical analyses of this coal see part I of this bulletin, p. 133.

GRANITE COUNTY.

DRUMMOND. PROSPECT.

Sample.—Subbituminous coal; analysis No. 10534 (p. 134).

Location.—Prospect near Northern Pacific mine in the NW. ¼ NW. ¼ sec. 35, T. 11 N., R. 13 W., near Drummond.

The bed was measured and sampled in June, 1910, by J. T. Pardee, as shown below:

Section of coal bed in prospect near Drummond.

Laboratory No	10534	
	Ft	*in.*
Coal	2	6
Parting [a]	0	6
Coal	2	0
Thickness of bed	5	0
Thickness of coal sampled	4	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 134.

MEAGHER COUNTY.

DORSEY. REES MINE.

Sample.—Bituminous coal; analysis No. 5733 (p. 134).

Mine.—Rees; at the head of Sixteen-Mile Creek in the NW. ¼ NW. ¼ sec. 6, T. 5 N., R. 9 E., about 10 miles southeast of Dorsey, on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Eagle, in the Eagle sandstone of Upper Cretaceous age. The bed at the point of sampling is 3 feet 9 inches thick. It dips west at an angle of about 35°. The mine is barely 20 feet below the surface.

The bed was measured and sampled by R. W. Stone in September, 1907, as shown below:

Section of coal bed at Rees mine, 10 miles southeast of Dorsey.

Laboratory No	5733	
	Ft.	*in.*
Coal	1	5
Clay [a]	0	2
Crushed coal	2	2
Thickness of bed	3	9
Thickness of coal sampled	3	7

[a] Not included in sample.

Notes.—The sample was taken in the mine, then abandoned, about 200 feet from the entry. As the face had been exposed to air for several years, the sample represented more or less weathered coal. This coal in the upper bench is bright and hard, but the lower bench is composed of crushed bone and dirty coal high in ash.

For chemical analyses of this coal see part I of this bulletin, p. 134; also U. S. Geol. Survey Bull. 341, p. 89.

HARLOWTON. PROSPECT.

Sample.—Subbituminous coal; analysis No. 5734 (p. 134).

Location.—Prospect; in the SW. ¼ SW. ¼ sec. 31, T. 7 N., R. 14 E., 12 miles southwest of Harlowton, on Big Elk Creek, ½ mile east of Big Elk post office, and 8 miles south of Twodot on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Eagle, in the Eagle sandstone of Upper Cretaceous age. This bed, as exposed by a small pit among sandstone ledges, has a total thickness of 2 feet 2 inches.

The bed was measured and sampled by R. W. Stone in August, 1907, as described below:

Section of coal bed in prospect, 12 miles southwest of Harlowton.

Laboratory No.	5734	
	Ft.	*in.*
Coal	0	4
Clay [a]	0	8
Coal	1	2
Thickness of bed	2	2
Thickness of coal sampled	1	6

[a] Not included in sample.

Notes.—As the sample was virtually from the outcrop, the coal was more or less weathered. It is a low-grade subbituminous coal.

For chemical analyses of this coal see part I of this bulletin, p. 134; also U. S. Geol. Survey Bull. 341, p. 89.

MUSSELSHELL COUNTY.

Musselshell County was not established until after this report had been prepared. Mines now included in that county, but listed under other counties in this report, are designated by footnote references.

PARK COUNTY.

ALDRIDGE. ALDRIDGE MINE.

Sample.—Bituminous coal; Electric field; analyses Nos. 3666, 6599, 6600, 6639 (p. 134).

Mine.—Aldridge; in the NW. ¼ sec. 1, T. 9 S., R. 7 E.

Coal beds.—No. 1 and No. 3. The coal is of Cretaceous age, Mesaverde (?) formation.

The bed was measured and sampled by W. R. Calvert in September, 1908, as shown below:

Section of No. 3 coal bed in Aldridge mine at Aldridge.

Laboratory No.	6639	
	Ft.	*in.*
Coal	0	9
Sandstone	0	1½
Coal	0	4
Sandstone	0	½
Coal	1	4
Clay	0	4
Coal	0	7
Thickness of bed	3	6

Sample 6639 was taken at a point 10,000 feet in the mine.

Sample 6599 was taken from the No. 1 bed, 6,000 feet from mouth of mine, and represented about 4½ feet of coal.

Sample 6600 represented washed coal, two-thirds of which was from the Aldridge mine and one-third from the Foster mine.

Sample 3666 was collected in 1906 by J. P. Rowe. No description of the sample is available.

Samples 6599 and 6600 were submitted by mine superintendent under the direction of Mr. Calvert.

Note.—The coal from the No. 3 bed is a high-grade bituminous coal.

For chemical analyses of this coal see part I of this bulletin, p. 134.

ALDRIDGE. FOSTER MINE.

Sample.—Bituminous (?) coal; analyses Nos. 6600, 6601 (p. 134).

Mine.—Foster; about 1½ miles southwest of Aldridge, in sec. 2, T. 9 S., R. 7 E.

Coal bed.—No. 1. Cretaceous age, Mesaverde formation.

Sample 6601 was taken 800 feet from mine mouth.

Sample 6600 represented washed coal, two-thirds of which was from the Aldridge mine and one-third from the Foster mine.

Note.—The above samples were taken by the mine superintendent by direction of W. R. Calvert.

For chemical analyses of this coal see part I of this bulletin, p. 134.

CHIMNEY ROCK. MAXEY MINE.

Sample.—Bituminous coal; Trail Creek field; analysis No. 6607 (p. 134).

Mine.—Maxey; near Chimney Rock, in the NW. ¼ sec. 27, T. 3 S., R. 8 E.

Coal bed.—Maxey. Lowest of Mesaverde (?) formation, Cretaceous age. Thickness, about 9 feet. Dip, 10°.

The bed was measured and sampled in September, 1908, by W. R. Calvert, as shown below:

Section of coal bed in Maxey mine, near Chimney Rock.

Laboratory No.	6607	
Roof, sandstone:	*Ft.*	*in.*
Coal	2	8
Bone [a]	0	2
Coal	0	6
Sandstone [a]	0	2
Coal	5	6
Thickness of bed	9	0
Thickness of coal sampled	8	8

[a] Not included in sample.

The sample was taken at the face of the entry, 850 feet from the mouth of the mine.

Notes.—The coal is bituminous, noncoking. The production was 150 tons daily in September, 1908. The output was shipped, for domestic use chiefly, as far west as Washington. The main entry was in 850 feet at the time of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 134.

ELECTRIC (HORR). NEWTON MINE.

Sample.—Bituminous coal; Electric field; analysis No. 6610 (p. 134).

Mine.—Newton; in the NW. ¼ sec. 7, T. 9 S., R. 8 E., near Electric (Horr), on the Northern Pacific Railway.

Coal bed.—No name. Cretaceous age, Mesaverde (?) formation. Average thickness in mine, about 4 feet 4½ inches. At the point of sampling the bed is 2 feet 11 inches thick and contains no partings.

The bed was measured and sampled in 1908 by W. R. Calvert.

The sample was taken about 1,000 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 134.

ELECTRIC. MOUNTAIN HOUSE (KORENTZ) MINE.

Sample.—Bituminous coal; analysis No. 3725 (p. 135).

Mine.—Mountain House (Korentz); about 7 miles from Electric

Coal bed.—No name. Cretaceous age, Mesaverde (?) formation.

The bed in this mine was measured and sampled by J. P. Rowe in 1906.

The sample was taken 4,300 feet from mine entrance. No record of the sampling is available.

For chemical analyses of this coal see part I of this bulletin, p. 135.

LIVINGSTON. LIVINGSTON MINE.

Sample.—Bituminous coal; Livingston field; analysis No. 6596 (p. 135).

Mine.—Livingston; near Livingston, in the NE. ¼ NW. ¼ sec. 25, T. 2 S., R. 8 E.

Coal bed.—Principal bed of Mesaverde (?) formation, Cretaceous age; variable in thickness, but averages at this mine about 31 inches. Shale floor and roof. Dip 55°.

The bed was measured and sampled at face by W. R. Calvert in August, 1908. The sample was taken from a 31-inch cut made 100 feet from the mine entrance.

Notes.—The coal is coking. At the time of sampling the bed was opened by a short entry.

For chemical analyses of this coal see part I of this bulletin, p. 135.

MYERSBURG. POTTER'S MINE.

Sample.—Bituminous coal; analysis No. 5723 (p. 135).

Mine.—Potter's; 8 miles north of Myersburg, in sec. 36, T. 5 N., R. 8 E. The nearest railroad station is at Dorsey, 15 miles away, on the Chicago, Milwaukee & St. Paul Railway.

Coal bed.—Not named. Cretaceous age, Eagle sandstone. This small mine is close to the surface in outcrop coal on a bed ranging from 2 to 3 feet in thickness and apparently pinching out laterally.

Notes.—The sample was taken from a bin where it has been lying under cover for several months. The moisture probably is less than what would have been found in a sample taken at the mine, and it is believed that the ash from this selected coal is less than what would have been found in a sample taken from across the entire thickness of the bed. The coal is bituminous, and of rather higher grade than that found elsewhere around the Crazy Mountains. The sample was collected in 1906.

For chemical analyses of this coal see part I of this bulletin, p. 135. Also U. S. Geol. Survey Bull. 341, p. 89.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 88.

RAVALLI COUNTY.

DARBY. NICHOLSON MINE.

Sample.—Subbituminous coal; analysis No. 3589 (p. 135).

Mine.—Nicholson; in the NW. ¼ NE. ¼ sec. 34, T. 4 N., R. 21 W., 3 miles north of Darby.

The bed in this mine was measured and sampled in 1906 by J. P. Rowe.

For chemical analyses of this coal see part I of this bulletin, p. 135.

ROSEBUD COUNTY.

BIRNEY. KENDRICK MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5403 (p. 135).

Mine.—Kendrick; in sec. 2, T. 8 S., R. 43 E., 12 miles southeast of Birney. No railroad connection.

Coal bed.—Kendrick. Tertiary age, Fort Union formation.

The bed was measured and sampled in 1907 by J. A. Taff. The sample represented 11 feet 3 inches of clear coal. It represented the entire thickness of the bed and was taken 60 feet from the surface of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 83.

SWEET GRASS COUNTY.

NYE. LOFFER MINE.

Sample.—Bituminous coal; analysis No. 6320 (p. 135).

Mine.—Loffer; in the NW. ¼ NE. ¼ sec. 29, T. 4 S., R. 16 E., 6 miles northeast of Nye, in the Upper Stillwater basin.

Coal bed.—Sole workable bed of the Eagle sandstone, Cretaceous age. Roof and floor, sandstone; dip 11° to north.

The bed was measured and sampled in July, 1908, by F. H. Kay, as shown below:

Section of coal bed in Loffer mine, 6 miles northwest of Nye.

Laboratory No	6320	
Roof, sandstone.	*Ft.*	*in.*
Coal	0	5
Sandstone [a]	0	2
Coal	0	11
Bone [a]	1	0
Coal	3	3
Floor, sandstone.		
Thickness of bed	5	9
Thickness of coal sampled	4	7

[a] Not included in sample.

Notes.—The sample was taken at face of the entry; the coal is badly weathered for 125 feet from entry mouth. Up to the time of sampling a small amount of coal had been mined for local use.

For chemical analyses of this coal see part I of this bulletin, p. 135.

WINNECOOK. PROSPECT DRIFT.

Sample.—Subbituminous coal; analysis No. 5735 (p. 135).

Mine.—A prospect drift on Joe Creek, in the SE. ¼ sec. 1, T. 6 N., R. 16 E., 6½ miles southwest of Winnecook and 10 miles southeast of Harlowton, on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—This is a local bed in the lower part of the Judith River formation, Cretaceous age. It has a roof of massive sandstone.

The bed was measured and sampled by R. W. Stone in July, 1907, as shown below:

Section of coal bed in prospect drift, 6½ miles southwest of Winnecook.

Laboratory No	5735	
Roof, massive sandstone.	*Ft.*	*in.*
Coal, solid	0	8
Coal, crushed	1	6
Coal, solid	0	2
Thickness of bed	2	4
Thickness of coal sampled	2	4

Notes.—The middle bench, 18 inches of crushed coal, is composed of bone and very dirty coal, but the sample taken represented the thickness of the bed. As the face from which the sample was cut is not over 20 feet from the entry and as it had been exposed to the weather for at least two or three years, the sample probably represented somewhat weathered coal. In 1907 the drift was in only a short distance.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 89.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 81.

WINNECOOK. HOLCOMB CREEK OUTCROP.

Sample.—Subbituminous coal; analysis No. 5732 (p. 135).

Location.—An outcrop in the SE. ¼ sec. 11, T. 6 N., R. 16 E., on south bank of Holcomb Creek, about 12 miles southeast of Harlowton and 8 miles southeast of Winnecook, Meagher County, on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—This is a local bed in the lower part of the Judith River formation, Cretaceous age. It is exposed under massive sandstone in the creek bank, where it has a thickness of 30 inches of clean coal.

The bed was measured and sampled by R. W. Stone in July, 1907. As the sample was taken from the outcrop the analysis represents badly weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 89.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 81.

VALLEY COUNTY.

CULBERTSON. BRUEGGER MINE.

Sample.—Lignite; Fort Peck Indian Reservation field; analysis No. 7059 (p. 135).

Mine.—Bruegger; in sec. 8, T. 28 N., R. 56 E., 3 miles north of Culbertson, on the Great Northern Railway.

Bed.—Has no local name, but is designated as "Bed G" in the Government report stated below. The bed lies about 1,000 feet above the base of the "yellow beds" of the Fort Union formation of early Eocene age. Its thickness is fairly uniform, and at this particular locality the bed lies practically flat. At the Bruegger mine the roof is a sandy clay, which may give place horizontally to some other material within a few yards. The floor is clay.

The bed was measured and sampled in September, 1908, by C. D. Smith and J. A. Davis. The sample represented 8 feet 6 inches to 9 feet of coal It was collected on the west side of the main entry, which is about 200 feet long. The bed is free from partings and the sample represented the whole thickness of the bed.

Notes.—The lignite from this mine does not differ in general characteristics from that found in the southeastern quarter of Montana. In 1908 it had only a local use.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 381, p. 59.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 53.

YELLOWSTONE COUNTY.

BUCKEY. PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 5798 (p. 135).

Location.—A prospect; 3 miles northeast of Buckey, in the NE. ¼ NW. ¼ sec. 36, T. 6 N., R. 26 E.

Coal bed.—Dorrity. Tertiary age, Fort Union formation. This bed lies about 200 feet above the Buckey coal, about 200 feet below the Mammoth. In this field it is very persistent in thickness and quality. The thickness ranges between 2 and 3 feet. At this prospect the bed is about 2 feet 8 inches thick.

The bed was measured and sampled in 1907 by L. H. Woolsey, as shown below:

Section of bed in prospect, 3 miles northeast of Buckey.

Laboratory No	5798	
	Ft.	*in.*
Coal, with bony layers	0	9
Coal	1	11
Thickness of bed	2	8
Thickness of coal sampled	2	8

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[a] Now included in Musselshell County.

The sample was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 341, pp. 64, 68.

BUCKEY. PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 5801 (p. 135).

Location.—A prospect in the NE. ¼ NE. ¼ sec. 27, T. 6 N., R. 26 E., 3½ miles north of Buckey. No railroad connection.

Coal bed.—Dorrity. Tertiary age, Fort Union formation.

The bed was measured and sampled in 1907 by R. W. Richards. It showed 2 feet of clear coal. The sample was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 64.

BUCKEY. PROSPECT.

Sample.—Subbituminous coal; Bull Mountain field: analyses Nos. 5799, 5797 (p. 135).

Location.—A prospect 4½ miles northeast of Buckey, in the NE. ¼ SW. ¼ sec. 30, T. 6 N., R. 27 E.

Coal bed.—Mammoth. Tertiary age, Fort Union formation. This is the most important bed in the Bull Mountain field. Its thickness ranges from 2 to 15 feet. In general it lies nearly flat. At the prospect opening sampled the bed is about 8½ feet thick.

The bed was measured and sampled in 1907 by L. H. Woolsey.

Sample 5797 was taken from the upper bench, which was 18 inches thick at the point of sampling, and sample 5799 was taken from the lower bench, which was 7 feet thick. Sample 5797 represented badly weathered coal; sample 5799 represented slightly weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 135; also U. S. Geol. Survey Bull. 341, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 64.

BUCKEY. PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 5800 (p. 136).

Location.—A prospect in SW. ¼ NE. ¼ sec. 23, T. 8 N., R. 25 E., 15 miles northwest of Buckey and 1 mile east of Roundup (Fergus County).

Coal bed.—Roundup. Tertiary age, Fort Union formation. This bed is commercially the most important bed in the northern part of the Bull Mountain field and is worked at several mines. The bed has a rather persistent roof of heavy sandstone. At this prospect the bed is about 4 feet thick with two partings, one of sandstone and the other of shale.

The bed was measured and sampled in 1908 by R. W. Richards; the sample represented 4 feet of coal.

Notes.—The coal of the Roundup bed in this field is high-grade subbituminous. It is considered a good steam coal and seems to stand shipment well if mined from under sufficient cover.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 381, p. 79; Bull. 341, p. 74.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62; Bull. 341, p. 64.

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[a] Now included in Musselshell County.

HUNTLEY. OUTCROP.

Sample.—Subbituminous (?) coal; Bull Mountain field; analyses Nos. 6828, 6831 (p. 136).

Location.—Outcrop opening in the SW. ¼ NW. ¼ sec. 10, T. 6 N., R. 28 E., 28 miles northeast of Huntley, at Douglas camp, on Cow Gulch.

Coal bed.—Mammoth. Tertiary age, Fort Union formation. The bed varies greatly in thickness because of partings. At this exposure it is about 27 feet thick with several sandstone and shale partings.

The bed was measured and sampled by R. W. Richards in 1908, as shown below:

Sections of coal bed in opening 28 miles northwest of Huntley.

Laboratory No.	6828		6831	
	Ft.	*in.*	*Ft.*	*in.*
Coal	..	..	[a]2	6
Coal	[a]8	6	6	0
Shale	[a]0	3	[a]0	3
Sandstone	[a]2	0	[a]2	0
Shale	[a]0	6	[a]0	6
Sandstone, gray	[a]10	0	[a]10	0
Shale	[a]0	6	[a]0	6
Coal	2	0	[a]2	0
Shale	[a]1	0	[a]1	0
Coal	3	0	[a]3	0
Thickness of bed	27	9	27	9
Thickness of coal sampled	5	0	6	0

[a] Not included in sample.

In sample 6831 only 6 feet of the 8 feet 6 inches in the upper bench was sampled; in sample 6828 all the lower bench was taken except the shale parting.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 381, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

HUNTLEY. COW GULCH PROSPECT.

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 6830 (p. 136).

Location.—Cow Gulch prospect; in the NW. ¼ SE. ¼ sec. 10, T. 6 N., R. 28 E., about 28 miles northeast of Huntley.

Coal bed.—Dougherty. Tertiary age, Fort Union formation. The bed is persistent throughout the northern part of the Bull Mountain field. It lies about 510 feet above the Roundup coal and 40 feet above the Chandler. It contains partings of shale, but is one of the cleanest beds in the field. It generally has a sandstone roof and a shale floor, and, like the other beds in the field, lies nearly flat. The bed is about 4 feet 10 inches thick with a shale parting.

The bed was measured and sampled in 1908 by R. W. Richards, as shown below:

Section of coal bed in Cow Gulch prospect, 28 miles northeast of Huntley.

Laboratory No.	6830	
	Ft.	*in.*
Coal	0	1½
Shale[a]	0	1
Coal	4	9
Thickness of bed	4	11½
Thickness of coal sampled	4	10½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 381, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

MUSSELSHELL. NEVORBIG & TODD MINE.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 9129 (p. 136).

Mine.—Nevorbig & Todd (surface outcrop), in Hawk valley in sec. 2, T. 8 N., R. 29 E., about 4 miles southeast of Musselshell, and 4 miles south of the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Custer. Tertiary age, Fort Union formation. The bed is thickest in the northeastern part of the field. In this mine iron pyrite is rather plentiful. The roof is excellent, consisting of massive sandstone 4 inches thick. The floor consists of 2½ feet of hard drab shale.

The bed was sampled and measured by Henry Hinds on August 8, 1909. The sample represented 2 feet 6½ inches of coal.

Notes.—In 1909 the coal from this mine was used locally. It "stocks" better than some other coals in the vicinity. The sample collected was practically unweathered.

For chemical analyses of this coal see part I of this bulletin, p. 136.

MUSSELSHELL. ROBBINS PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 7197 (p. 136).

Location.—Robbins prospect; on Carpenter Creek, in the SE. ¼ SE. ¼ sec. 17, T. 9 N., R. 30 E., 6 miles east of Musselshell post office.

Coal bed.—Carpenter, probably corresponding to the Snyder of another part of the field. Thickness variable, ranging up to 8 feet. Tertiary age, Fort Union formation.

The bed was measured and sampled by R. W. Richards in 1908, as shown below:

Section of coal bed in Robbins prospect, 6 miles east of Musselshell.

Laboratory No.	7197	
Roof, shale:	*Ft.*	*in.*
Coal (left in roof)[a]	0	9
Coal	3	7
Bone[a]	0	2
Coal	0	11
Floor, shale, bituminous (base not exposed).		
Thickness of bed	5	5
Thickness of coal sampled	4	6

[a] Not included in sample.

The sample was taken from the face of the tunnel, about 75 feet from the surface, under about 25 feet of cover. The sample probably represented weathered coal.

Note.—At this prospect the coal is generally pitch black, with a dark-brown to black streak. It mines in blocks. Joints are prominent in slightly weathered coal. Only a few tons of coal had been mined in 1909.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 381, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

MUSSELSHELL. GRANT PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 7195 (p. 136).

Location.—Grant prospect; on Fishel Creek, in the SE. ¼ NE. ¼ sec. 29, T. 8 N., R. 29 E., 8 miles south of Musselshell post office.

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[a] Now included in Musselshell County.

Coal bed.—Buckey. Tertiary age, Fort Union formation. Its thickness ranges from 1 foot to 5 feet; attitude generally horizontal but locally with high dips. Roof in places sandstone, in others shale. Locally the bed is characterized by a 6-inch shale parting.

The bed was measured and sampled in 1908 by R. W. Richards. The sample represented 2½ feet of coal, which was overlain with about 3 inches of shale and 33 feet of sandstone. The sample was taken from the face of the entry, about 100 feet from the surface, and under about 75 feet of cover.

Note.—This prospect was worked in a small way as a local source of coal prior to the entrance of the railroad into Musselshell. It had been abandoned in 1909.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 381, p. 79.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

MUSSELSHELL. CUSTER PROSPECT.

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8467 (p. 136).

Location.—Custer prospect; in the NW. ¼ SW. ¼ sec. 28, T. 9 N., R. 30 E., 7 miles east of Musselshell and about 5 miles south of the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Custer. Tertiary age, Fort Union formation. The thickness is quite irregular, the bed being thickest in the northeast part of the field. The roof is fairly good, consisting mostly of fine-grained grayish clay shale. The floor is similar to the roof, except that the clay shale is brownish.

The bed was sampled and measured by H. Hinds on July 5, 1909, as shown below:

Section of coal bed in Custer prospect, 7 miles east of Musselshell.

Laboratory No.	8467	
Roof, clay shale.	*Ft.*	*in.*
Coal, bony and shaly [a]	0	4
Coal	2	4
Thickness of bed	2	8
Thickness of coal sampled	2	4

[a] Not included in sample.

The sample was taken in the prospect, 15 feet from entrance.

Notes.—Practically no coal had been removed from this prospect. The sample was slightly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 136.

MUSSELSHELL. GRANT PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8466 (p. 136).

Location.—Grant prospect; in sec. 26, T. 9 N., R. 30 E., 9 miles east of Musselshell, in the Carpenter Creek valley and approximately 3 miles south of Musselshell River.

Coal bed.—Carpenter Creek. Tertiary age, Fort Union formation. Thickness, rather variable, ranging from 18 inches to 8 feet at the outcrop along the north side of the field. Along the east side of the field this bed is practically worthless. Dip, about 5° S. in this prospect. The roof in general is a sandy shale, but at this prospect it is a massive sandstone. The floor is a black carbonaceous shale.

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[a] Now included in Musselshell County.

This bed was sampled and measured by C. T. Lupton on July 5, 1909, as shown below:

Section of coal bed in Grant prospect, 9 miles east of Musselshell.

Laboratory No.	8466	
Roof, light-gray, massive sandstone.	*Ft.*	*in.*
Shale, carbonaceous [a]	0	1
Coal, bright	2	6
Coal, dull	2	1
Bone [a]	0	2½
Coal, bright	1	1½
Shale, brown [a]	0	1
Coal, impure	0	7
Coal, bright	1	7
Floor, carbonaceous shale.		
Thickness of bed	8	3
Thickness of coal sampled	7	10½

[a] Not included in sample.

Notes.—The sample was somewhat weathered. All coals in this field are of subbituminous grade and do not stock well. The prospect from which the sample was taken was opened in 1907.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 431, p. 186.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 179.

MUSSELSHELL. MARY McCLEARY AND ANNE OKER PROSPECT.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8465 (p. 136).

Location.—Mary McCleary and Anne Oker prospect; southeast of Grant prospect; in the NE. ¼ SE. ¼ sec. 26, T. 9 N., R. 30 E., 9½ miles east of Musselshell, approximately 3 miles south of Musselshell River.

Coal bed.—McCleary. Tertiary age, Fort Union formation. Its thickness ranges from a few inches to 8 feet 6 inches. The roof for the most part consists of soft sandstone and a clayey shale. At the point of sampling the roof and the floor were clayey shale. The floor is clay in most places.

The bed was measured and sampled by C. T. Lupton on July 15, 1909. The sample represented 3 feet 9 inches of coal, or the full thickness of the bed.

Notes.—This drift, 50 feet long, was made to determine the thickness of the bed. The coal at the end of the drift where the sample was taken was slightly weathered, on account of the thin cover (10 to 15 feet) over it. Calcite and "sulphur" are noticeable in the joints of this coal.

For chemical analyses of this coal see part I of this bulletin, p. 136; also U. S. Geol. Survey Bull. 431, p. 175.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 175.

MUSSELSHELL. OUTCROP.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8464 (p. 137).

Location.—An outcrop in the SE. ¼ NW. ¼ sec. 36, T. 9 N., R. 30 E., about 10 miles east of Musselshell.

Coal bed.—Buckey. Tertiary age, Fort Union formation. Thickness is fairly uniform, more uniform than that of any other bed in the eastern part of this field. Roof where sampled is a massive sandstone 25 feet thick with a thin bed of shale below. In some other parts of the field, the sandstone roof is replaced by soft clayey shale. A 3 to 6 inch bed of black carbonaceous shale lies between the coal and the sandstone.

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[a] Now included in Musselshell County.

The floor is drab carbonaceous shale 4 to 5 inches thick, beneath which is massive gray sandstone.

The bed was sampled by H. Hinds and measured by C. T. Lupton on July 15, 1909. The sample represented a 1-foot 2-inch cut of coal.

Notes.—The coal in this bed is grayish black, but gives a dark-brown streak. The coal has an irregular fracture, dense texture, and is brittle and crumbly when dry The sample collected was slightly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 431, p. 175.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 173.

ROUNDUP. REPUBLIC NO. 1 MINE.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8803 (p. 137).

Mine.—Republic No. 1; a shaft mine, ¼ mile south of Roundup, in the NE. ¼ NW. ¼ sec. 24, T. 8 N., R. 25 E., on the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Roundup. Tertiary age, Fort Union formation. The thickness at this mine is uniform, ranging from 5 feet 9 inches to 6 feet 1 inch. Near Roundup the bed dips slightly to the southwest. The roof consists of about 1 foot of gray shale overlain with sandstone. The floor is a 1-foot bed of fire clay. The mine shaft is 145 feet deep.

The bed was measured and sampled by C. T. Lupton on August 6, 1909, as shown below:

Section of coal bed in Republic No. 1 mine, ¼ mile south of Roundup.

Laboratory No.	8803	
Roof, light-gray shale; sandstone above.	*Ft.*	*in.*
Bone, black [a]	0	3¾
Coal, bright	5	8½
Floor, fire clay; overlying sandstone.		
Thickness of bed	6	¼
Thickness of coal sampled	5	8½

[a] Not included in sample.

The sample was taken 800 feet east of the foot of the shaft. The sample was not weathered.

Notes.—Coal was used entirely for heating and power purposes in 1909; cokes, but none of it had been used for coking. The mine had an output of 500 to 700 tons of coal per day. Run-of-mine was produced mainly, the coal as mined being clean.

For chemical analyses of this coal see part I of this bulletin, p. 137.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

ROUNDUP. REPUBLIC NO. 2 MINE.[a]

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8802 (p. 137).

Mine.—Republic No. 2; a shaft mine located near center of sec. 36, T. 8 N., R. 25 E., about 3 miles southwest of Roundup village, on a branch of the Chicago, Milwaukee & Puget Sound Railroad.

Coal bed.—Roundup. Tertiary age, Fort Union formation. One of the important beds of the Bull Mountain field. The thickness at this mine is uniform, varying only slightly from 5 feet 8 inches. The roof consists of 2 to 3 feet of light-gray shale which is overlain with hard sandstone. The mine shaft reached the coal at a reported depth of 347 feet. The floor is a light-gray shale 2 to 3 feet thick.

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[a] Now included in Musselshell County.

The bed was measured and sampled by C. T. Lupton on August 6, 1909, as shown below:

Section of Roundup coal bed in Republic No. 2 mine, 3 miles southwest of Roundup.

Laboratory No	8802
Roof, shale, light-gray, beneath hard sandstone.	*Ft. in.*
Bone, black [a]	0 3
Coal bright, hard	5 8
Floor, light-gray shale.	
Thickness of bed	5 11
Thickness of coal sampled	5 3

[a] Not included in sample.

The sample was taken 500 feet northwest of the foot of the shaft.

Notes.—The sample was not weathered. In 1909, the coal was used for heating and power purposes. It cokes, but none of it had been used for coking. This mine produced approximately 300 tons per day. Run-of-mine was produced mainly. The output of this mine and of the No. 1 was utilized by the railroad in 1909.

For chemical analyses of this coal see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 471.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

WACO. OUTCROP.

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 9130 (p. 137).

Location.—An outcrop on Buffalo Creek, in the NE. ¼ NW. ¼ sec. 16, T. 5 N., R. 31 E., 15 miles northwest of Custer, 6 miles northwest of Waco.

Coal bed.—Perry. Tertiary age, Fort Union formation. This bed, like others in the field, has a lenticular structure and varies considerably in thickness. The roof is rather poor, in most places a brown or drab shale. The floor varies from bony coal to shale.

The bed was measured and sampled by C. T. Lupton on September 14, 1909, as shown below:

Section of coal bed in outcrop, 6 miles northwest of Waco.

Laboratory No	9130
Roof, brown shale.	*Ft. in.*
Bone [a]	0 1½
Coal bright	2 0
Bone [a]	0 3
Floor, bone to shale.	
Thickness of bed	2 4½
Thickness of coal sampled	2 0

[a] Not included in sample.

The sample was weathered and damp, but was the best obtainable.

For chemical analyses of this coal see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 431, p. 186.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 181.

WOLF SPRING. PROSPECT.

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8621 (p. 137).

Location.—Prospect; on Alkali Creek, in sec. 10, T. 7 N., R. 31 E., 1 mile east of Wolf Spring.

Coal bed.—Big Dirty. Tertiary age, in the Lebo member of the Fort Union formation. Its thickness ranges from 10 to 24 feet; at the outcrop sampled the bed has a slight dip to the west. The roof is mostly a grayish clay shale, but here and there becomes sandy. The floor is usually sandy clay shale.

The bed was sampled by C. T. Lupton and H. Hinds on August 2, 1909. No detailed section was measured at the point where the sample was taken. In general, the bed consists of thin beds of grayish-brown carbonaceous sandstone alternating with coal beds 2 to 12 inches in thickness. The bed where sampled is 15 to 16 feet thick.

The section following is typical of the best part of the bed throughout the Bull Mountain field.

Section of best part of Big Dirty coal bed in T. 8 N., R. 32 E.

	Ft.	in.
Grayish clay or sandy shale.		
Shale, sandy, white	0	2
Coal	0	1
Sandstone, carbonaceous, calcareous	0	5
Coal, good (exceptionally thick)	0	9
Coal, with 3 streaks of oolitic sandstone	0	6
Sandstone, carbonaceous, hard	0	4
Coal with two streaks of oolitic sandstone	0	9
Sandy clay shale.		

Notes.—Ranchers in the vicinity were reported to have used the coal for fuel. In sampling no partings were discarded. As the sample was taken from a surface outcrop, it represented weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 431, p. 186.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62; Bull. 431, p. 182.

WOLF SPRING. PROSPECT.

Sample.—Subbituminous coal; Bull Mountain field; analysis No. 8578 (p. 137).

Location.—Surface prospect; located on Alkali Creek in the NE. ¼ NW. ¼ sec. 32, T. 8 N., R. 31 E., 2 miles north of Wolf Spring.

Coal bed.—McCleary. This bed lies about 50 feet above the Carpenter, and probably corresponds to the Snelling of the central part of the field. Tertiary age, Fort Union formation. Its thickness ranges from 8 feet 6 inches to less than 14 inches. The roof is rather poor, in most places a soft sandstone or a clayey shale. The floor is clay for the most part.

The bed was measured and sampled by C. T. Lupton on July 30, 1909, as shown below:

Section of coal bed in surface prospect, 2 miles north of Wolf Spring.

Laboratory No	8578	
Roof, drab shale.	Ft.	in.
Shale, brown [a]	0	½
Coal	1	5
Shale, brown [a]	0	½
Coal, bright	2	9
Shale, carbonaceous, brownish [a]	0	1½
Coal [a]	0	2½
Shale, drab [a]	0	4
Coal, streak [a]	0	½
Floor, drab clay.		
Thickness of bed	4	11½
Thickness of coal sampled	4	2

[a] Not included in sample.

The sample was somewhat weathered.

Notes.—The coal soon crumbles on exposure to the air. The ranchers near by obtain their winter supply of fuel from this prospect.

For chemical analyses of this coal see part I of this bulletin, p. 137.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 62.

NEW MEXICO.

COLFAX COUNTY.

Blossburg. Dutchman Mine.

Sample.—Bituminous coal; Raton field (New Mexico No. 5), analyses Nos. 3226, 3227 (p. 137).

Mine.—Dutchman; at Blossburg, on the Atchison, Topeka & Santa Fe Railway.

Coal bed.—"Raton." Cretaceous age, Vermejo[a] formation. The bed averages about 7 feet thick. Roof, bony coal; floor, hard shale.

The bed was measured and sampled by J. W. Groves at two points on May 10, 1906, as described below:

Sections of coal bed in Dutchman mine at Blossburg.

Laboratory No.	3226		3227	
Roof, bony coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3½	1	10
Shale	[a]0	½	0	¼
Coal	0	3	2	9
Bone	0	¼	[a]0	1
Coal	0	2	2	0
Bone and shale	0	¼	[a]0	½
Coal	1	2	0	5
Bony coal	[a]0	1½	[a]0	¾
Coal	3	10	0	6
Floor, hard shale.				
Thickness of bed	6	11	7	8½
Thickness of bed sampled	6	9	6	6¼

[a] Not included in sample.

Sample 3226 was taken in room 6, fifth north entry, 5,300 feet north of slope opening. Sample 3227 was taken in room 1, second subentry, 4,200 feet southwest of slope opening.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 185; Bureau of Mines Bull. 23, pp. 65, 172; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 185; Bureau of Mines Bull. 13, pp. 170, 274; briquetting tests: U. S. Geol. Survey Bull. 332, p. 186; washing tests: U. S. Geol. Survey Bull. 332, p. 186; coking tests: U. S. Geol. Survey Bull. 332, p. 186; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 186.

For chemical analyses see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 332, p. 184.

Brilliant. Nos. 2 and 3 Mines.

Sample.—Bituminous coal; Raton field; (New Mexico No. 4) analyses Nos. 3228, 3229 (p. 137).

Mines.—No. 2 and No. 3; at Brilliant.

Coal bed.—"Tinpan." Cretaceous or Tertiary age, Raton formation. Roof, shale and bony coal; floor, shale over sandstone.

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[a] The coal-bearing rocks of the Raton Mesa region, which includes the Raton coal field in New Mexico and the Trinidad field in Colorado, were formerly placed in the Laramie formation, but it is now known that they are separated by an unconformity into two formations. The United States Geological Survey has named the older formation, which is of Montana-Cretaceous age, the Vermejo formation, and the younger one, which is of Cretaceous or Tertiary age, the Raton formation.

The bed was measured and sampled by J. S. Burrows and J. W. Groves on May 9, 1906, as described below:

Sections of coal bed in No. 2 and No. 3 mines at Brilliant.

Laboratory No.	3228		3229	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale and bony coal.				
Coal	0	9	1	10
Bone [a]	1	4	0	0
Sandstone [a]	..	..	0	2½
Coal	1	6	2	2
Sandstone [a]	0	¾	..	..
Coal	2	0	..	..
Floor, shale.				
Thickness of bed	5	7¾	4	2½
Thickness of coal sampled	4	3	4	0

[a] Not included in sample.

Sample 3228 was taken 475 feet southwest of the drift mouth.

Sample 3229 was taken 800 feet south of drift mouth, in room 11, off main entry 2.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 182; Bureau of Mines Bull. 23, pp. 165, 172; producer-gas tests: Bureau of Mines Bull. 13, pp. 170, 274; washing tests: U. S. Geol. Survey Bull. 332, p. 183; coking tests: U. S. Geol. Survey Bull. 332, p. 183; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 183.

For chemical analyses see part I of this bulletin, p. 137; also U. S. Geol. Survey Bull. 332, p. 181.

DAWSON. NO. 2 MINE.

Sample.—Bituminous coal; Raton field; analysis No. 256–D (Denver No. 9) and analysis No. 6606 (p. 137).

Mine.—No. 2; a drift mine, in the Raton (?) district at Dawson, on the El Paso & Southwestern Railroad.

Coal bed.—"Raton." Cretaceous age, Vermejo formation. Thickness, 6 to 11 feet. The bed lies nearly horizontal. Roof, bony coal; floor, bony coal, with shale below.

The bed was measured and sampled by J. W. Groves on January 15, 1908, as described below:

Section of coal bed in No. 2 mine at Dawson.

Laboratory No.	256–D	
	Ft.	*in.*
Roof, bony coal.		
Coal	0	5
Shale [a]	0	3
Coal	1	4
Shale [a]	0	1
Coal	3	0
Shale [a]	0	1
Coal	0	7
Floor, bony coal.		
Thickness of bed	5	9
Thickness of coal sampled	5	4

[a] Not included in sample.

Sample 256–D was measured in room 21, in east entry 7, off north entry 1, 6,000 feet north of the mine mouth.

The bed was also measured and sampled subsequently by J. W. Groves. The sample represented a 9¾-foot cut of coal. No record of the section is available.

Notes.—In 1908 part of the coal from this mine was made into coke; it was crushed and washed before coking. The shipping sizes produced were lump, over 1½-inch bar screen, screenings, and run-of-mine. The larger part of the product was marketed in El Paso, Tex., and in Bisbee and Douglas, Ariz.

For results of tests of this coal see mention of specific tests as follows—washing tests: U. S. Geol. Survey Bull. 368, pp. 28, 31; coking tests: U. S. Geol. Survey Bull. 368, pp. 44, 50.

For chemical analyses see part I of this bulletin, p. 138; also U. S. Geol. Survey Bull. 368, p. 19.

RATON. SUGARITE MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6286 (p. 138).

Mine.—Sugarite; a drift mine 3 miles northeast of Raton, in sec. 16, T. 31 N., R. 24 E. (private survey).

Coal bed.—Sugarite. Cretaceous or Tertiary age, Raton formation. The thickness is regular and the bed lies nearly horizontal. The roof and the floor consist of shale.

The bed was measured and sampled by W. T. Lee on July 23, 1908, as described below:

Section of coal bed in the Sugarite mine, near Raton.

Laboratory No	6286	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	2
Shale [a]	0	4
Coal [a]	0	6
Shale [a]	0	6½
Coal	4	7½
Floor, shale.		
Thickness of bed	6	2
Thickness of coal sampled	4	7½

[a] Not included in sample.

Notes.—The sample was collected from a working face in the mine, 1,800 feet from the mouth and represented the main bench only. The coal is hard, clean, coking, bituminous, and in 1908 was used entirely as a domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 138.

RATON. HARTZEL MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6285 (p. 138).

Mine.—Hartzel; an abandoned drift mine about 5 miles northeast of Raton, in sec. 10, T. 31 N., R. 24 E. (private survey).

Coal bed.—Sugarite. Cretaceous or Tertiary age, Raton formation. The bed is comparatively regular in thickness but in some places is not thick enough to be commercially valuable at the present time. The bed has a shale roof and a shale floor.

The bed was measured and sampled by W. T. Lee on July 21, 1908, as described below:

Section of coal bed in Hartzel mine, 5 miles northeast of Raton.

Laboratory No	6285	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	11
Shale [a]	3	0
Coal [a]	0	6
Shale [a]	0	6
Coal	0	9
Shale [a]	0	1½
Coal	2	10
Floor, shale.		
Thickness of bed	8	7½
Thickness of coal sampled	3	7

[a] Not included in sample.

Notes.—The sample was collected from a freshly cleared face 50 feet from the mouth of entry of the abandoned mine. The coal is hard, firm, and bright, and seemingly is a good coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 138.

RATON. LATIMORE PROSPECT.

Sample.—Bituminous coal; Raton field; analysis No. 6287 (p. 138).

Mine.—Latimore; a prospect drift entry in the side of Johnson's mesa, about 6 miles east of Raton, in sec. 24, T. 31 N., R. 24 E.

Coal bed.—Not named. Cretaceous or Tertiary age, Raton formation. The bed is uniform in thickness and lies nearly horizontal. The roof and the floor consist of hard shale.

The bed was measured and sampled by W. T. Lee on July 23, 1908, as described below:

Section of coal bed in Latimore prospect, 6 miles east of Raton.

Laboratory No	6287	
Roof, shale.	*Ft.*	*in.*
Coal	1	1
Shale [a]	0	2
Coal	0	6½
Shale [a]	0	5
Coal	0	4
Pyrite [a]	0	¾
Coal	1	1
Shale [a]	0	6½
Coal	1	10
Floor, shale.		
Thickness of bed	6	¾
Thickness of coal sampled	4	10½

[a] Not included in sample.

Notes.—The sample was collected from a freshly cleared face of an abandoned entry 300 feet from its mouth. The coal is hard and clean, and, like most of the coal in this field, is high grade, coking, bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 138.

RATON. SCOOP MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6284 (p. 138).

Mine.—Scoop; a prospect drift entry in the north face of Johnson's Mesa, about 10 miles east of Raton, sec. 10, T. 51 N., R. 25 E.

Coal bed.—Not named. Cretaceous or Tertiary age, Raton formation. The roof and the floor are both shale.

The bed was measured and sampled by W. T. Lee on July 15, 1908. The sample represented 4 feet 1 inch of coal.

Notes.—The sample was collected from a nearly clean face of coal exposed by a landslide in the gulch near the Scoop mine, which was inaccessible at the time of investigation, and represented the entire thickness of the bed. The coal is hard, bright, bituminous, and, like most of the coal of this field, is probably coking.

For chemical analyses of this coal see part I of this bulletin, p. 138.

RATON. DEAD EASY MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6595 (p. 138).

Mine.—Dead Easy; a drift mine in Spring Gulch, in Vermajo Park, about 32 miles west of Raton.

Coal bed.—"Raton." Cretaceous age, about 400 feet above the base of the Vermejo formation of this field. The roof is shale, overlain with conglomerate. The floor is shale.

The bed was measured and sampled by W. T. Lee on September 28, 1908, as described below:

Section of coal bed in the Dead Easy mine, in Vermajo Park.

Laboratory No	6595
	Ft. in.
Roof, shale.	
Coal[a]	1 11
Coal bony[a]	0 6
Coal	3 5
Bone[a]	0 1
Coal	1 8
Flour, shale.	
Thickness of bed	7 7
Thickness of coal sampled	5 1

[a] Not included in sample.

Notes.—The sample was collected from a working face 222 feet from the opening of the mine. The coal is hard and tough and seemingly is high-grade bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 138.

VAN HOUTEN. WILLOW MINE.

Sample.—Bituminous (?) coal; Raton field (New Mexico No. 3); analyses Nos. 3221, 3222 (p. 138).

Mine.—Willow; drift opening at Van Houten.

Coal bed.—"Raton." Cretaceous age, Vermejo formation. Thickness, 6 feet 11 inches.

The bed was measured and sampled at two points by J. W. Groves on May 8, 1906, as described below:

Section of coal bed in Willow mine, at Van Houten.

Laboratory No	3222	3221
	Ft. in.	*Ft. in.*
Roof, coal.		
Coal	0 5	0 11
Shale	.. ..	[a] 0 1¼
Bone	0 ¼	.. ..
Coal	1 1	[a] 0 2
Shale	.. ..	[a] 0 1
Bone	0 1	.. ..
Coal	0 9	[a] 0 1½
Shale	.. ..	[a] 0 1¼
Bony coal	[a] 0 7	.. ..
Coal	1 4	1 5
Bony coal	.. ..	[a] 0 7½
Bone	[a] 0 2	.. ..
Coal	0 5	2 6
Shale	.. ..	0 ¼
Bone	[a] 0 2½	.. ..
Coal	1 11	0 10
Floor, hard, gray shale.		
Thickness of bed	6 11¾	6 10¾
Thickness of coal sampled	6 ¼	5 8¼

Sample 3222 was taken in left entry 1, 3,000 feet from entrance to mine.

Sample 3221 was taken in room 36, off right entry 4, 2,000 feet northwest of entrance to mine.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 178; Bureau of Mines Bull. 23, pp. 65, 171; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 179; Bureau of Mines Bull. 13, pp. 171, 274; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 180.

For chemical analyses see part I of this bulletin, p. 138; also U. S. Geol. Survey Bull. 332, p. 178.

VAN HOUTEN. WILLOW NO. 5 AND WILLOW NO. 6 MINES.

Sample.—Bituminous coal; Raton field; analyses Nos. 6930 and 6931 (Ann Arbor No. 2) and analyses Nos. 6417 and 6418 (p. 139).

Mine.—Willow No. 5 and Willow No. 6; drift mines in sec. 34, T. 30 N., R. 22 E. (private survey), at Van Houten, on the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—"Raton." Cretaceous age, Vermejo formation. The thickness is rather uniform and the bed lies nearly horizontal. The roof is shale in some places and sandstone in others. The floor is shale.

The bed was measured and sampled by W. T. Lee on August 25, 1908, as described below:

Section of coal bed in Willow No. 5 mine, at Van Houten.

Laboratory No.	6417, 6418	
Roof, conglomeratic sandstone.	*Ft.*	*in.*
Coal	1	3
Bone	0	1½
Coal	0	6
Coal, bony	0	4
Coal	3	4
Coal, bony	0	10
Coal	0	1½
Shale	0	3
Coal	4	5
Floor, shale.		
Thickness of bed	11	2
Thickness of coal sampled	5	1

Sample 6417 was collected from a working face in left entry 3. It represented only the upper 5 feet 1 inch of coal from the upper bench, the bone partings being excluded.

Sample 6418 represented the 4 feet 6½ inches of coal in the lower bench, the partings being excluded.

The bed was also measured and sampled at two points on December 6, 1908, by K. M. Way, as shown below:

Sections of coal bed in Willow No. 5 and Willow No. 6 mines, at Van Houten.

Laboratory No.	6931		6930	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	..	..	0	3¼
Coal	3	10	3	3¾
Hard shale [a]	0	1	0	1¼
Coal	0	5	1	4
Bony coal [a]	0	7	1	2
Coal	0	9	1	3½
Bony coal [a]	0	2½	0	⅜
Coal	1	7¼	2	4
Shale	0	¼	..	..
Coal	2	4	..	..
Floor, shale.				
Thickness of coal bed	9	10	9	10⅛
Thickness of coal sampled	8	11½	8	3¼

[a] Not included in sample.

Sample 6931 was taken 500 feet west of opening of Willow No. 5 mine, in crosscut between third and fourth entries, near room 6. It was dry when taken.

Sample 6930 was taken 800 feet south of opening of Willow No. 6 mine, in room 5, off third left entry. It was dry when taken.

Notes.—The coal from No. 5 mine is harder than that from the No. 6 mine; same bed is worked in both mines, but owing to several basaltic intrusions the physical character is different. The coal from both mines is a coking coal. In 1908 the output was sold mostly for commercial purposes and passed over 5-inch screen. Sizes smaller than 5 inches were sold to Atchison, Topeka & Santa Fe Railroad. The daily output of No. 5 mine was 550 tons; output of No. 6 mine not stated. Some of the coal was made into coke.

For results of illuminating gas tests of this coal see Bureau of Mines Bull. 6, pp. 37, 47.

For chemical analyses see part I of this bulletin, p. 139.

YANKEE. YANKEE NO. 3 MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6243 (p. 139).

Mine.—Yankee No. 3; a drift mine located at Yankee, in the NW. ¼, SW. ¼, sec. 1, T. 31 N., R. 24 E.

Coal bed.—Yankee. Cretaceous or Tertiary age, Raton formation. The thickness is irregular and the bed lies nearly horizontal. The roof is shale, 6 inches thick, above which is sandstone. The floor is soft shale which heaves.

The bed was measured and sampled by W. T. Lee on July 2, 1908, as described below:

Section of coal bed in Yankee No. 3 mine, at Yankee.

Laboratory No.	6243	
Roof, sandstone.	*Ft.*	*in.*
Shale[a]	0	6
Coal	0	10
Bone[a]	0	1½
Coal	0	6½
Coal bony[a]	0	1½
Coal	0	2½
Bone[a]	0	1½
Coal	0	6½
Shale[a]	0	6
Coal	2	1
Bone[a]	0	6
Floor, soft shale.		
Thickness of bed	6	1
Thickness of coal sampled	4	2½

[a] Not included in sample.

Notes.—The sample was collected from a working face 1,000 feet from the mouth of the main entry. The coal is of fair quality and cokes. The mine was in operation when the sample was taken, but was shut down later.

For chemical analysis of this coal see part I of this bulletin, p. 139.

YANKEE. LLEWELLYN MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6255 (p. 139).

Mine.—Llewellyn; a drift mine about 3 miles southeast of Yankee, in sec. 20, T 31 N., R. 25 E.

Coal bed.—Not named. Cretaceous or Tertiary age, Raton formation. The thickness is regular and the bed lies nearly horizontal. The roof and the floor consist of soft shale.

The bed was measured and sampled by W. T. Lee on July 8, 1908, as described below:

Section of coal bed in Llewellyn mine, 3 miles southeast of Yankee.

Laboratory No.	6255	
Roof, shale.	*Ft.*	*in.*
Coal	0	6
Shale[a]	0	1
Coal	1	0
Bone[a]	0	½
Coal	3	3
Shale[a]	0	½
Coal	0	5
Shale[a]	0	8
Coal	1	3½
Floor, shale.		
Thickness of bed	7	3½
Thickness of coal sampled	6	6½

[a] Not included in sample.

Notes.—The sample was collected from a working face in the mine 150 feet from the mouth of the main entry. The coal is relatively soft, but, like most of the coals in the Raton field, is a coking bituminous coal. In 1908 the mine was operated for local consumption only.

For chemical analyses of this coal see part I of this bulletin, p. 139.

YANKEE. REYNOLDS MINE.

Sample.—Bituminous coal; Raton field; analysis No. 6244 (p. 139).

Mine.—Reynolds; a prospect drift mine 2 miles north of Yankee, in sec. 30, T. 32 N., R. 25 E.

Coal bed.—Not named. Cretaceous or Tertiary age, Raton formation. The bed is irregular in thickness and lies nearly horizontal. It has a shale roof and a shale floor.

The bed was measured and sampled by W. T. Lee on July 2, 1908, as described below:

Section of coal bed in Reynolds mine, 2 miles north of Yankee.

Laboratory No	6244	
Roof, shale.	*Ft.*	*in.*
Coal[a]	0	7
Shale[a]	1	0
Coal	0	9
Shale[a]	0	3
Coal	1	7½
Shale[a]	0	4½
Coal	1	10
Floor, shale.		
Thickness of bed	6	5
Thickness of coal sampled	4	2½

[a] Not included in sample.

Notes.—The coal is relatively hard and like most of the coals of this field will coke. At time of sampling in 1908 the mine had not been equipped for production.

For chemical analyses of this coal see part I of this bulletin, p. 139.

McKINLEY COUNTY.

BLACKROCK. ZUNI INDIAN SCHOOL MINE.

Sample.—Bituminous (?) coal; Durango-Gallup field; analysis No. 3952 (p. 139).

Mine.—Zuni Indian School; about 10 miles northeast of Blackrock.

Coal bed.—Not named. Cretaceous age; in the Benton group, below the Mesaverde formation. The bed lies between a shale roof and a fireclay floor. A section and sample were taken in the mine by M. K. Shaler in 1906, the section being cut across the full thickness, 3 feet 4 inches, of the bed, which was without partings.

The sample was taken 50 feet from the mouth of the mine.

Notes.—Coal from this mine supplies the Zuni Indian School at Blackrock, N. Mex. It is reported to be a good fuel coal. In 1906 the mine was opened by a short entry. About 500 tons a year are mined.

For chemical analyses of this coal see part I of this bulletin, p. 139; also U. S. Geol. Survey Bull. 316, p. 423.

CHAVES. TIEJEN PROSPECT.

Sample.—Subbituminous coal; San Juan region; analysis No. 2361 (p. 139).

Location.—Tiejen prospect; in T. 16 N., R. 11 W., 16 miles northeast of Chaves. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1905 by F. C. Schrader, as shown below:

Section of coal bed in Tiejen prospect, 16 miles northeast of Chaves.

Laboratory No.	2261	
	Ft.	*in.*
Coal	1	3
Shale[a]	0	1½
Coal	3	6
Thickness of bed	4	10½
Thickness of coal sampled	4	9

[a] Excluded from sample.

. For chemical analyses of this coal see part I of this bulletin, p. 139; also U. S. Geol. Survey Bull. 316, p. 413.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 254; Bull. 341, p. 375.

CLARKVILLE. CLARK MINE.

Sample.—Bituminous (?) coal; Durango-Gallup field; analysis No. 2434 (p. 139).

Mine.—Clark, at Clarkville, 4 miles west of north of Gallup, in sec. 14, T. 15 N. R. 19 W.

Coal bed.—Clark. Cretaceous age, Mesaverde formation; it is the third in ascending order of five beds at Clarkville, but is the only one that was mined in 1906. The bed has a shale roof and fireclay floor; thickness varies from 4½ to 8½ feet.

A section and sample were taken in the mine by M. K. Shaler in 1906, the section being as follows:

Section of coal bed in Clark mine, at Clarkville.

Laboratory No.	2434	
	Ft.	*in.*
Roof, shale.		
Coal	2	0
Coal, bony[a]	1	0
Coal	2	0
Shale[a]	0	3
Coal	3	3
Floor, fireclay.		
Thickness of bed	8	6
Thickness of coal sampled	7	3

[a] Not included in sample.

Notes.—The coals of this district make good fuel, but have not been satisfactorily coked. They are at about the same horizon as the beds mined at Gallup, N. Mex.

For chemical analyses of this coal see part I of this bulletin, p. 139. Also U. S. Geol. Survey Bull. 285, p. 258.

CLARKVILLE. ST. MICHAELS INDIAN SCHOOL MINE.

Sample.—Subbituminous coal; Gallup field; analysis No. 4112 (p. 139).

Mine.—St. Michaels Indian School, 14 miles northwest of Clarkville and 14 miles southeast of Fort Defiance, Ariz.

Coal bed.—Not named. Cretaceous age; Mesaverde formation. The bed has a sandstone roof and a shale floor; dip, about 2° SE.

A section of the bed and a sample of the coal were taken by M. K. Shaler in 1906. The section represented 4 feet 5 inches of coal. The sample was taken from a fresh stock pile.

Notes.—In 1906 this mine had for 16 years supplied coal for the Navajo Indian Agency at Fort Defiance. About 600 tons was mined annually. The coal is not known to be coking.

For chemical analyses of this coal see part I of this bulletin, p. 139; also U. S. Geol. Survey Bull. 316, p. 423.

GALLUP. OTERO MINE.

Sample.—Subbituminous coal; Gallup field; (New Mexico No. 2) analyses Nos. 1027, 1028, 1029, 1038 (pp. 139, 140).

Mine.—Otero; a slope and drift mine in the Gallup district, 1½ miles east of Gallup, in the NE. ¼ NW. ¼ sec. 14, T. 15 N., R. 18 W., on the Atchison, Topeka & Santa Fe Railroad.

Coal bed.—Three beds are worked at Gallup, designated locally the Crown Point, the Thatcher, and the Otero. They are of Cretaceous age, Mesaverde (?) formation. The Crown Point bed, which was not being worked when the mine was sampled, lies 11 feet above the Thatcher, and the latter is 88 feet above the Otero. Thickness of beds fairly uniform. The Thatcher bed is generally clean, but in places has lenses of dirty coal, one of which was included in the sample.

Each bed was measured and sampled at one point by M. R. Campbell, August 15, 1904, as described below:

Sections of coal beds in Otero mine, 1½ miles north of Gallup.

Section	A		B and C		D	
Laboratory No	1027		1028, 1029		1038	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	5	4	0	1	2
Shale[a]	0	8	..	..	0	9
Coal	1	5	..	..	3	2
Thickness of bed	5	6	4	0	5	1
Thickness of coal sampled	4	10	4	0	4	4

[a] Not included in sample.

Section A (sample 1027) was measured in the Crown Point bed, 400 feet from the mine mouth.

Sections B and C (samples 1028, 1029) were measured in the Thatcher bed, 500 feet from the mine mouth.

Section D (sample 1038) was measured in the Otero bed, about 2,000 feet from the mine mouth.

Notes.—The coal from this mine, like that from others in the field, is soft and friable and makes much slack. In 1904 the lump coal was shipped west, much of it reaching the Pacific coast. The pea coal was used under the boiler at the plant. The dust separated from the coal in screening was wasted for the most part.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 753; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 65; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1447; Bull. 261, p. 162.

For chemical analyses see part I of this bulletin, pp. 139, 140; also U. S. Geol. Survey Prof. Paper 48, p. 241; Bull. 261, p. 50; Bull. 316, p. 423.

GALLUP. WEAVER MINE.

Sample.—Subbituminous coal; Gallup field; (New Mexico No. 1) analyses Nos. 1023, 1024, 1025, 1026 (p. 140).

Mine.—Weaver; a slope and drift mine in the SE. ¼ sec. 34, T. 16 N., R. 18 W., in the Gallup district, 3 miles north of Gallup, on the Santa Fe system.

Coal beds.—Often designated locally the 3 and the 3½. They are of Cretaceous age, Mesaverde (?) formation. Thickness, fairly uniform; roof of both beds, hard sandstone underlain in 3½ bed with 1½ inches of "draw slate" that is taken down in mining. In both beds the floor is clay. At the time of sampling, the coal in both beds, so far as observed, was clean, the beds being free from parting or lenses of shale or "sulphur." The beds are separated by about 5½ feet of sandstone.

Each bed was measured and sampled at one point by M. R. Campbell in 1904.

Section A (samples 1023, 1024) was measured in No. 3 bed, about 2,000 feet in the mine. Each sample represented 4 feet 1 inch of coal.

Section B (samples 1025, 1026) was measured in No. 3½ bed, about 600 feet in the mine. Each sample represented 6¼ feet of coal.

Notes.—The coal from these mines, like that from many others in this field, is friable. In 1904 the coal was usually screened over a ½-inch screen, and that which went over was sometimes screened over a 4-inch screen, separating it into lump and engine coal.

The output of the mine in 1904 was 1,500 tons a day. The larger part of the lump coal was shipped to the Pacific coast and to intermediate points. The engine coal was taken by the Santa Fe system. The pea coal was used by the railroad for boilers at pumping stations. Most of the slack was wasted.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 745; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 65; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1446; Bull. 261, p. 161.

For chemical analyses see part I of this bulletin, p. 140; also U. S. Geol. Survey Prof. Paper 48, p. 240; Bull. 261, p. 49; Bull. 316, p. 423.

RIO ARRIBA COUNTY.

LUMBERTON. BURNS-BIGGS MINE.

Sample.—Bituminous (coking) coal; Monero field; analysis No. 5761 (p. 140).

Mine.—Burns-Biggs; in sec. 8, T. 31 N., R. 1 W., about 1½ miles southwest of Lumberton.

Coal bed.—"No. 1." Cretaceous age, Mesaverde formation. Thickness, fairly uniform; dip, about 5° W.; roof, sandstone; floor, clay shale.

The bed was measured and sampled by J. H. Gardner on July 8, 1908. The sample represented 3 feet of clear coal, the thickness of the bed.

The sample was taken about 200 feet down the main slope.

Notes.—This coal bed is about on the horizon of the beds mined at Monero, N. Mex., in the next township east. The coal was reported by the manager of the mine to be a coking coal, as shown by practical tests on a commercial scale. It is hard and black and is classed as bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 140; also U. S. Geol. Survey Bull. 341, p. 363.

MONERO. KUTZ MINE.

Sample.—Bituminous coal; Monero field; analysis No. 2121 (p. 140).

Mine.—Kutz; at Monero, in sec. 17, T. 31 N., R. 1 E., on the Denver & Rio Grande Railway.

Coal bed.—Upper. Cretaceous age, Mesaverde formation. Dip, 4½° W.

The bed was measured and sampled in 1905 by F. C. Schrader and M. K. Shaler. The bed showed 3 feet 5 inches of clear coal. The bed lies 50 feet above the lower coal bed.

Note.—Much of the output was sold to the Denver & Rio Grande Railroad.

For chemical analyses of this coal see part I of this bulletin, p. 140; also U. S. Geol. Survey Bull. 285, p. 258; Bull. 341, p. 363.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 247.

MONERO. RIO ARRIBA MINE.

Sample.—Bituminous coal; Monero field; analysis No. 2122 (p. **141**).

Mine.—Rio Arriba; in sec. 7, T. 31 N., R. 1 E.

Coal bed.—Lower (40-inch). Cretaceous age, Mesaverde formation. The bed is about 33½ inches thick at the point of sampling.

A measured section of the bed showed 2 feet 9½ inches of coal, which was included in the sample.

Note.—The total output in the year 1906 was 26,000 tons, which was mostly sold to the Denver & Rio Grande Railroad.

For chemical analyses of this coal, see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 341, p. 363.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 258; Bull. 341, p. 352.

SANDOVAL COUNTY.

ALGODONES. SLOAN MINE.

Sample.—Bituminous coal; Una del Gato field; analysis No. 1013 (p. 141).

Mine.—Sloan; in sec. 17, T. 13 N., R. 6 E., 12 miles southeast of Algodones. No railroad connection.

Coal bed.—Hopewell. Cretaceous age, Mesaverde (?) formation.

The bed was measured and sampled on August 18, 1904, by M. R. Campbell, as shown below:

Section of coal bed in Sloan mine, 12 miles southeast of Algodones.

Laboratory No	1013	
	Ft.	*in.*
Coal	1	9
Shale[a]	0	8½
Coal	1	3
Thickness of bed	3	8½
Thickness of coal sampled	3	0

[a] Excluded from sample.

The sample was taken in drift, about 20 feet from entrance. The coal bed is badly faulted at this place.

For chemical analyses of this coal, see part I of this bulletin, p. 141; also U. S. Geol. Survey Prof. Paper 48, p. 271; Bull. 316, p. 430.

For geologic relations, see U. S. Geol. Survey Bull. 316, pp. 429–430.

ALGODONES. HAGAN MINE.

Sample.—Bituminous coal; Una del Gato field; analysis No. 1012 (p. 141).

Mine.—Hagan; in sec. 33, T. 13 N., R. 6 E., 14 miles southeast of Algodones and 27 miles northeast of Albuquerque. No railroad connection.

Coal bed.—Hopewell. Cretaceous age, Mesaverde (?) formation. Thickness, averages 4 feet; dip, 15° NE.; roof and floor, massive sandstone; cover, 700 feet.

The bed was measured and sampled on August 17, 1904, by M. R. Campbell. The sample represented 4 feet 1 inch of clear coal. It was obtained in the main slope, 700 feet from mine entrance.

Note.—The bed is generally free from shale or clay partings. The coal is hard and bright; it is used commercially.

For chemical analyses of this coal, see part I of this bulletin, p. 141; also U. S. Geol. Survey Prof. Paper 48, pp. 106, 271; Bull. 316, p. 430.

SAN JUAN COUNTY.

FRUITLAND. YOUNG OR STEPHENS MINE.

Sample.—Subbituminous (?) coal; Durango field; analysis No. 2464 (p. 141).

Mine.—Young or Stephens; in the NW. ¼ SW. ¼ sec. 4, T. 29 N., R. 15 W., 1½ miles northwest of Fruitland.

At the time this mine was sampled there was no railroad connection; but since then a branch of the Denver & Rio Grande has been built southward from Durango, and now it may connect with this mine.

Coal bed.—Carbonero. Cretaceous age, "Laramie" (?) formation.

The bed was measured and sampled in 1905 by F. C. Schrader and M. K. Shaler, as shown below:

Section of coal bed in Young or Stephens mine, 1½ miles northwest of Fruitland.

Laboratory No	2464	
Roof, shale.	*Ft.*	*in.*
Coal[a]	4	0
Coal, bony[a]	0	6
Coal[a]	5	0
Shale[a]	0	2
Coal[a]	2	0
Shale[a]	0	2½
Coal	5	0
Thickness of bed	16	10½
Thickness of coal sampled	5	0

[a] Not included in sample.

The sample was obtained at end of drift, 100 feet from entrance.

Note.—The coal was used for local consumption at time of sampling in 1905.

The total output in the fiscal year 1910 was 833 tons.

For chemical analyses of this coal, see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 285, p. 258; Bull. 316, p. 423.

For geologic relations, see U. S. Geol. Survey Bull. 316, p. 398.

PENDLETON. JONES MINE.

Sample.—Subbituminous (?) coal; Durango field; analysis No. 2465 (p. 141).

Mine.—Jones; in sec. 21, T. 32 N., R. 13 W., 1½ miles northwest of Pendleton. No railroad connection at time of sampling.

Coal bed.—Carbonero. Cretaceous age, "Laramie" (?) formation. Dip, 25° SE.

The bed was measured and sampled in 1905 by F. C. Schrader and M. K. Shaler. The bed is 48+ feet thick. The part sampled is 7 feet thick, but the position of this 7 feet of coal with regard to the entire bed was not given.

For chemical analyses of this coal see part I of this bulletin, p. 141; also U. S. Geol. Surv. Bull. 285, p. 258; Bull. 316, p. 423.

PUTNAM. PUEBLO BONITA MINE.

Sample.—Subbituminous coal; Chaco field; analysis No. 3823 (p. 141).

Mine.—Pueblo Bonita; 1 mile west of Putnam, in T. 21 N., R. 11 W., on the south wall of Chaco Canyon.

Coal bed.—The coal is of Cretaceous age, in the upper strata of the Mesaverde formation. A shallow drift has been opened into the bed for the purpose of supplying coal to a local store at Putnam; at this point, 60 feet from the mouth, a section and sample were taken by M. K. Shaler on September 16, 1906, the section being as follows:

Section of coal bed in Pueblo Bonita mine, 1 mile west of Putnam.

Laboratory No.	3823	
	Ft.	*in.*
Roof, massive sandstone.		
Coal, bony [a]	1	6
Coal	3	8
Coal, bony [a]	0	4
Coal	2	4
Thickness of bed	7	10
Thickness of coal sampled	6	0

[a] Not included in sample.

The sample was taken 60 feet from the mouth of the mine.

Notes.—The coal is considered a good fuel, and is easily mined on account of the massive sandstone roof. A very small amount had been used at the time of sampling in 1906.

For chemical analyses of this coal see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 316, p. 423.

TIZ NATZIN. LOCAL MINE.

Sample.—Subbituminous coal; Chaco field; analysis No. 3811 (p. 141).

Mine.—A local mine at Tiz Natzin, in T. 23 N., R. 14 W., 25 miles northwest of Putnam, and 2 miles up Coal Creek from Rio Chaco.

Coal bed.—The coal is of Cretaceous age, in the upper strata of the Mesaverde formation.

At a shallow drift made to supply coal for a local store, a sample and section were taken by M. K. Shaler in 1906, the section being as follows:

Section of coal bed in drift at Tiz Natzin.

Laboratory No.	3811	
	Ft.	*in.*
Roof, sandstone.		
Coal [a]	1	8
Coal, bony [a]	0	5
Coal	3	2
Floor, fire clay.		
Thickness of bed	5	3
Thickness of coal sampled	3	2

[a] Not included in sample.

The sample was taken in 50-foot drift, presumably at breast.

Note.—The coal makes a quick hot fire, and leaves a light, white ash.

For chemical analyses of this coal see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 316, p. 423.

SAN MIGUEL COUNTY.

PECOS. COWLES MINE.

Sample.—Subbituminous (?) coal; Pecos field; analysis No. 6862 (p. 141).

Mine.—Cowles; 6½ miles north of Pecos, in the NE. ¼ NE. ¼, sec. 28, T. 18 N., R. 12 E.

Coal bed.—Cowles. Carboniferous age, Pennsylvanian series, thus being, in respect to age, an exception to the coals in the Rocky Mountain province. The bed is opened by a drift in the west cliffs of the Pecos River. The thickness of the bed is irregular. The roof and the floor are shale.

The bed was measured and sampled by J. H. Gardner on April 23, 1908. The sample included 1 foot 3 inches of coal.

Notes.—This coal has been mined for fuel in connection with the mining of metallic ores. The bed is 7 to 15 inches thick, and there is a high percentage of ash in the coal produced. This ash is largely in the form of thin, shaly layers in the bed which can not be separated except by washing.

For chemical analyses of this coal see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 381, p. 450.

SANTA FE COUNTY.

MADRID. MADRID NO. 1 MINE.

Sample.—Anthracite coal; Cerillos field; analysis No. 6153 (p. 141).

Mine.—Madrid No. 1; at Madrid, on Ortiz land grant, about 4 miles southwest of Cerillos on the Santa Fe System.

Coal bed.—White Ash (?). Cretaceous age, probably Mesaverde formation. Thickness, irregular; roof, thin hard shale overlaid with sandstone; above the sandstone is a 5-foot layer of shale, above which is an 80-foot lava sill; floor, hard shale.

The bed was measured and sampled 200 feet down main entry by J. H. Gardner on April 10, 1908, the section representing 2 feet 10 inches of coal.

Notes.—This coal is anthracite, probably having been metamorphosed by an intrusion of igneous rock above the bed, as shown in the section at the mine. The same coal bed, one-fourth mile north of this mine beyond the boundary of the sill, is bituminous coal. (See laboratory No. 6154.) The coal from the Madrid mine compares favorably in fuel value with Pennsylvania anthracites. In 1908 it was used in various cities of the West and Southwest and was shipped to some extent to the Pacific coast.

The coal was broken and assorted into various sizes.

For chemical analyses of this coal, see part I of this bulletin, p. 141.

MADRID. WHITE ASH MINE.

Sample.—Bituminous coal; Cerillos field; analysis No. 6154 (p. 141).

Mine.—White ash; at Madrid on Ortiz land grant, about 4 miles southwest of Cerillos on the Santa Fe Railroad.

Coal bed.—White Ash. Cretaceous age, probably Montana group. Roof, shale overlaid with sandstone; floor, shale.

The bed was measured and sampled by J. H. Gardner on April 10, 1908. The sample represented 4 feet 6 inches of clear coal. The sample was taken in the main entry, 120 feet in.

Notes.—The coal is bituminous, though it is from the same bed as the "Anthracite No. 1." (See laboratory No. 6153.) This coal is considered a high-grade fuel coal, and in 1908 was shipped to various markets in the Southwest.

For chemical analyses of this coal, see part I of this bulletin, p. 141.

SOCORRO COUNTY.

CARTHAGE. BERNAL MINE.

Sample.—Bituminous coal; Carthage field (Denver No. 31); analyses Nos. 890–D, 889–D (p. 141).

Mine.—Bernal; a slope mine near Carthage.

Coal bed.—Carthage. Cretaceous age, Mesaverde formation. Thickness, fairly uniform.

The bed was measured and sampled in 1908 by K. M. Way, as shown below:

Section of coal bed in Bernal mine near Carthage.

Section	A		B	
Laboratory No.	890–D		889–D	
Roof, bone coal, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	1½	1	2
Shale [a]	0	1¾	0	6
Coal	1	2	0	6¼
Shale and sulphur [a]	0	¾	..	..
Sulphur	..	..	0	¼
Coal	1	¾	1	7¼
Bastard fire clay [a]	0	2	0	3
Coal	0	8½	1	6½
Coal and shale	0	¾	..	..
Coal	0	8¾	..	..
Floor, shale.				
Thickness of bed	5	2¾	5	7¾
Thickness of coal sampled	4	10¼	4	10

[a] Not included in sample.

Section A (sample 890–D) was measured 870 feet south of the slope mouth, in left dip 2.

Section B (sample 889–D) was measured 700 feet south of the slope mouth, in room 2, off right entry 1.

Notes.—The coal was shipped to towns in the Southwest and to railroads in Mexico.

For results of tests of this coal, see mention of specific tests as follows: Washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 56.

For chemical analyses, see part I of this bulletin, p. 141.

CARTHAGE. HILTON MINE.

Sample.—Bituminous (coking) coal; Carthage field; analysis No. 6004 (p. 141).

Mine.—Hilton; in the NE. ¼ NE. ¼ sec. 15, T. 5 S., R. 2 E., at Carthage, on the New Mexico Midland Railroad.

Coal bed.—Carthage. Cretaceous age, probably Mesaverde formation. The same bed is mined at the Bernal, Government, and Allaire mines in the Carthage field. Thickness, fairly uniform; dip, extremely variable. Strata much faulted; roof, sandstone with discontinuous intervening thin shale which does not fall with the coal; floor, clay shale; cover varies from 50 to over 300 feet.

The bed was measured and sampled at a point 1,500 feet down the main slope by James H. Gardner on April 30, 1908. The sample represented 5 feet of clear coal.

Notes.—The coal from this mine is known to be coking, for it was once coked at San Antonio, N. Mex., on a commercial basis. In 1908 it was used in El Paso and other southwestern points as a high-grade fuel. There was no slack wasted in mining.

For chemical analyses of this coal, see part I of this bulletin, p. 141; also U. S. Geol. Survey Bull. 381, p. 458.

NORTH DAKOTA.

BILLINGS COUNTY.

BEACH. OPEN PIT.

Sample.—Lignite; Sentinel Butte field; analysis No. 5779 (p. 142).

Mine.—An open pit in the NW. ¼ sec. 16, T. 141 N., R. 105 W., 8 miles north of Beach, on the Northern Pacific Railway.

Lignite bed.—Nine workable beds of lignite are known in the Sentinel Butte field. They are generally variable in thickness and extent, but some have been traced for miles. This bed is one of four in what is termed the Medora group. It has no local name, but is designated as bed "E." It is of Tertiary (Eocene) age, Fort Union formation. Thickness, rather variable. The bed has a slight dip to the northeast, probably not more than 20 feet to the mile. The character of the roof and the floor varies greatly. The bench sampled is free from partings.

The bed was measured and sampled in 1907 by C. D. Smith, as shown below:

Section of lignite bed in local mine, 8 miles north of Beach.

Laboratory No	5779	
Roof, variable.	*Ft.*	*in.*
Lignite [a]	2	2
Clay [a]	0	6
Lignite [a]	0	5
Clay [a]	0	6
Lignite	5	6
Thickness of bed	9	1
Thickness of lignite sampled	5	6

[a] Not included in sample.

The bed is mined by stripping at the place where this sample was taken, and therefore the sample represented somewhat weathered lignite. No visible impurities occur in the part of the bed sampled.

Notes.—The lignite from this mine, like that found generally in the western half of North Dakota, is tough and woody when freshly mined, but upon exposure soon "slacks" or crumbles. In 1906 the output was used exclusively by ranchers for domestic purposes.

For chemical analyses of this lignite see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 341, p. 35.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 18.

BEACH. OPEN PIT.

Sample.—Lignite; Sentinel Butte field; analysis No. 5781 (p. 142).

Location.—Open pit, in the NW. ¼ sec. 8, T. 141 N., R. 105 W., 9 miles north of Beach, on the Northern Pacific Railway.

Lignite bed.—The bed is in the Fort Union formation of Tertiary age. It has no local name, but is designated in a report on the field as bed "E." It is rather irregular in thickness and has a very slight dip to the northeast—about 20 feet to the mile. Roof and floor vary greatly in character.

The bed was measured and sampled in 1907 by C. D. Smith, as shown below:

Section of lignite bed in an open pit, 9 miles north of Beach.

Laboratory No	5781	
Roof, sandy clay.	*Ft.*	*in.*
Lignite	6	6
Clay, sandy [a]	0	8
Lignite [a]	3	0
Thickness of bed	10	2
Thickness of lignite sampled	6	6

[a] Not included in sample.

The bed is mined by stripping at the point where this sample was taken, and the sample therefore represented more or less weathered lignite. No visible impurities occur in the part of the bed sampled.

Notes.—The lignite from this mine, like that found generally in the western half of North Dakota, is tough and woody when freshly mined, but upon exposure soon "slacks" and crumbles. In 1907 it was used exclusively for domestic purposes.

For chemical analyses of this lignite see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 341, p. 35.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 18.

BEACH. OPEN PIT.

Sample.—Lignite; Sentinel Butte field; analysis No. 5782 (p. 142).

Mine.—An open pit, in sec. 25, T. 139 N., R. 105 W., 9 miles southeast of Beach, on the Northern Pacific Railway.

Lignite bed.—The bed has no local name, but is designated in a report on this field as bed "F." It is of Tertiary age, Fort Union formation. The slight dip, possibly 20 feet to the mile, is northeastward.

The bed was measured and sampled in 1907 by C. D. Smith, as shown below:

Section of lignite bed in an open pit, 9 miles southeast of Beach.

Laboratory No.	5782	
Roof, sandy clay, weathered.	*Ft.*	*in.*
Lignite, weathered [a]	8	0
Clay [a]	0	10
Lignite (base concealed)	7	0
Thickness of bed	15	10
Thickness of lignite sampled	7	0

[a] Not included in sample.

The sample was taken from an open pit where the lignite is stripped for local use.

Notes.—The lignite at this mine was more or less weathered, hence only the lower bench was sampled. Like that found generally in the western half of North Dakota, it is tough and woody when freshly mined, but upon exposure soon "slacks" or crumbles. In 1907 it was used exclusively for domestic purposes.

For chemical analyses of this lignite see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 341, p. 35.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 18.

MEDORA. MEDORA MINE.

Sample.—Lignite; Sentinel Butte field; analysis No. 2428 (p. 142).

Mine.—Medora, a drift mine in sec. 26, T. 140 N., R. 102 W., at Medora.

Lignite bed.—The lignite is of Tertiary (early Eocene) age, Fort Union formation, and is designated bed "C" of the Medora group. It is more persistent and thicker than the other beds (B, D, E) of the Medora group in this field. Its thickness in this field is 8 to 16 feet. It lies nearly flat.

The bed was measured and sampled by A. G. Leonard on October 10, 1905, as shown below:

Section of lignite bed in the Medora mine, at Medora.

Laboratory No.	2428	
Roof, shale.	*Ft.*	*in.*
Lignite	8	2
Clay [a]	0	3
Lignite [a]	0	11
Thickness of bed	9	4
Thickness of lignite sampled	8	2

[a] Not included in sample.

The sample was taken from the face of the drift, about 30 feet from its mouth.

Notes.—The lignite from this bed, as from the other beds in the field, is in general tough and woody, and soon slacks on exposure. In 1905 it was mined for local use only.

For chemical analyses of this lignite see part I of this bulletin, p. 142.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 18.

SAND CREEK. OUTCROP.

Sample.—Lignite; Sentinel Butte field; analysis No. 2000 (p. 142).

Location.—Outcrop on Stillwagon (Russell) ranch on Sand Creek, in sec. 31, T. 135 N., R. 101 W., 8 miles northwest of Sand Creek post office.

Bed.—This lignite is of Tertiary (early Eocene) age, Fort Union formation.

The bed was measured and sampled by A. G. Leonard on July 8, 1905, as shown below:

Section of lignite bed in outcrop, 8 miles northwest of Sand Creek.

Laboratory No	2000	
Roof, shale.	*Ft.*	*in*
Lignite [a]	3	0
Clay [a]	2	6
Lignite	35	0
Shale, exposed above creek [a]	3	0
Thickness of bed	43	6
Thickness of lignite sampled	35	0

[a] Not included in sample.

The sample was collected from the outcrop, care being taken to get material as fresh as possible. The bed was so thick that the entire thickness was not sampled, but only the top, middle, and bottom. The lignite is brown and is decidedly woody in places. It slacks on exposure. In 1905 it had been mined at the outcrop only.

For chemical analyses of this lignite see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 285, p. 322.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 324.

SENTINEL BUTTE. OUTCROP.

Sample.—Lignite; Sentinel Butte field; analysis No. 2427 (p. 142).

Location.—Outcrop near the base of Sentinel Butte. The outcrop is near the northeastern corner of the butte, about 3 miles south of Sentinel Butte, in SE. ¼ sec. 5, T. 139 N., R. 104 W.

Lignite bed.—Bed "G." This bed is one of the two important beds (G and F) in the Sentinel Butte group of lignite beds in this field. It is of early Eocene age, Fort Union formation. The thickness varies somewhat, ranging from 3½ to 21 feet, and the bed dips slightly toward the northeast.

The bed was measured and sampled by A. G. Leonard on October 9, 1905, as shown below:

Section of lignite bed G in outcrop, 3 miles south of Sentinel Butte.

Laboratory No	2427	
Roof, sandy shale.	*Ft.*	*in.*
Coal	14	0
Clay [a]	0	3
Coal	6	11
Floor, clay.		
Thickness of bed	21	2
Thickness of lignite sampled	20	11

[a] Not included in sample.

The sample was collected from the outcrop, as fresh material as possible being taken. On account of the thickness of the bed, the sample was taken only from the top, middle, and bottom of the bed. The lignite is brown and woody and slacks on exposure.

For chemical analyses of this lignite see part I of this bulletin, p. 142.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 29.

SENTINEL BUTTE. OPEN PIT.

Sample.—Lignite; Sentinel Butte field analysis No. 5784 (p. 142).

Location.—An open pit; in the SE. ¼ sec. 5, T. 139 N., R. 104 W., 3 miles south of Sentinel Butte, on the Northern Pacific Railway.

Lignite bed.—The bed, which has no local name, has been designated bed F. It lies 25 to 50 feet below bed G in this field. It is of Tertiary age, Fort Union formation. Thickness, fairly uniform, ranging up to 7 feet. In places too dirty to work. Dip, slight, about 20 feet to the mile, northeast. Roof and floor extremely variable, so that it is impossible to predict their character a few yards from an exposure.

The bed was measured and sampled in 1907 by C. D. Smith, as shown below:

Section of lignite bed, 3 miles south of Sentinel Butte.

Laboratory No	5784	
Roof, variable.	*Ft.*	*in.*
Lignite	14	0
Clay [a]	0	3
Lignite [a]	6	11
Floor, clay.		
Thickness of bed	21	2
Thickness of lignite sampled	14	0

[a] Not included in sample.

Notes.—The lignite is mined by stripping, and at the time the sample was collected the face of the bed was much weathered. Only the upper bench of 14 feet was sampled, and this contained no visible impurities. The lignite from this mine, like that found generally in the western half of North Dakota, is tough and woody when freshly mined, but upon exposure soon slacks or crumbles. It was used exclusively for domestic purposes.

For chemical analyses of this lignite see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 341, p. 35.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 18.

BOWMAN COUNTY.

SCRANTON. SCRANTON MINE.

Sample.—Lignite; Bowman County field; (Pittsburg No. 11) analyses Nos. 7499, 7500 (p. 142).

Mine.—Scranton; a drift mine at Scranton, on the Chicago, Milwaukee & St. Paul Railroad.

Lignite bed.—"Upper." Cretaceous age, Fort Union formation. The bed is about 9 to 11 feet thick, with lignite roof and lignite floor. It lies nearly flat.

The bed was measured and sampled by K. M. Way on March 20, 1909, as shown below:

Sections of lignite bed in Scranton mine at Scranton.

Laboratory No	7499		7500	
Roof, coal, about 6 feet.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	10	1	4½
Shale and coal	[a] 0	3¼	0	½
Coal	4	10	5	3¾
Mother coal	..	..	0	⅜
Coal	..	..	1	1
Shale and coal	..	..	0	⅜
Coal	..	..	2	7½
Shale and coal	..	..	[a] 0	3
Coal	..	..	0	4
Thickness of bed	8	11¼	11	1
Thickness of coal sampled	8	8	10	10

[a] Not included in sample.

Sample 7499 was taken 700 feet east of opening, in face of butt entry 2.

Sample 7500 was taken 450 feet north of opening, in face of main entry.

The samples were dry when taken.

For results of briquetting tests of this lignite, see Bureau of Mines Bull. 14, pp. 31, 32.

For chemical analyses see part I of this bulletin, p. 142; also Bureau of Mines Bull. 14, p. 31.

McKENZIE COUNTY.

CARTWRIGHT. OUTCROP.

Sample.—Lignite; McKenzie County field; analysis No. 2201 (p. 142).

Location.—Outcrop, in sec. 3, T. 150 N., R. 103 W., 3 miles southeast of Cartwright.

Lignite bed.—Not named. Tertiary (early Eocene) age, Fort Union formation. At the point of sampling, the bed is 7 feet 10 inches thick and free from partings.

The bed was measured and sampled by A. G. Leonard on August 29, 1905. The sample represented 7 feet 10 inches of lignite.

The sample was taken from the outcrop, very little lignite having been mined.

For chemical analyses see part I of this bulletin, p. 142; also U. S. Geol. Survey Bull. 285, p. 322.

McLEAN COUNTY.

WILTON. WILTON (WASHBURN) MINE.

Sample.—Lignite; Washburn field; (North Dakota No. 3) analyses Nos. 1935, 1938 (p. 143).

Mine.—Wilton (Washburn); a shaft mine in the Wilton district, 1 mile east of Wilton, on the Minneapolis, St. Paul & Sault Ste. Marie.

Lignite bed.—One of several beds of lignite of irregular thickness and varying extent found near this locality. It is of Tertiary (Eocene) age, Fort Union formation. Thickness, variable; at this mine, 8 to 13 feet with a variable parting 1½ feet from the bottom. Dip very slight, eastward. Roof, clayey shale; in mining 2 or 3 feet of coal are left for a roof; floor, clay, 6 inches to 3 feet thick, underlain with 1 to 3 feet of coal. The mine shaft is 60 feet deep.

The bed was measured and sampled at two points by M. R. Campbell on August 3, 1905. The bed showed 9 feet 6 inches of clear coal. Section A (sample 1935) represented 6 feet 6 inches of coal, and section B (sample 1938) represented 5 feet 6 inches of coal; the remaining thickness of the coal bed at points of sampling is left in place as roof.

Sample 1935 was taken 1,570 feet from the shaft.

Sample 1938 was taken 3,300 feet from the foot of the shaft, in room 36, off east entry 1, north side.

Notes.—The lignite from this mine, like that from others in this field, is tough, and slacks on exposure. It will not stand long shipment. The lignite is used at points along the Minneapolis, St. Paul and Sault Ste. Marie Railroad for household use and steam production. In 1905 this was the largest and best equipped lignite mine in the State. Its rated capacity was 1,000 to 1,100 tons per day. The larger part of the product was shipped to Bismarck, Mandan, and Jamestown. The output during the summer was small; during fall and winter, nearly the full capacity of the mine. The slack was used at the mine power plant and was shipped to mills at Mandan. The lignite left as a roof in mining was ordinarily taken down when pillars were pulled.

For results of tests of this lignite, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 138; Bureau of Mines Bull., 23, pp. 65, 172; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 139; Bureau of Mines Bull. 13, pp. 174, 275.

For chemical analyses see part I of this bulletin, p. 143; also U. S. Geol. Survey Bull. 290, p. 138.

For geologic relations see U. S. Geol. Survey Bull. 381, pp. 21–26.

MORTON COUNTY.

HOWE. OUTCROP.

Sample.—Lignite; Standing Rock Reservation; analysis No. 7841 (p.143).

Location.—Outcrop, in the NE. ¼ sec. 5, T. 129 N., R. 88 W., 8 miles east of Howe and 7½ miles north of Morristown (S. Dak.). No railroad connection.

Lignite bed.—No name. Cretaceous or Tertiary age, Lance formation.

The bed was measured and sampled in 1909 by A. L. Beekly. It showed 2 feet 2 inches of lignite at the point of sampling.

For chemical analyses of this lignite see part I of this bulletin, p. 143.

HOWE. OUTCROP.

Sample.—Lignite; Standing Rock Reservation; analysis No. 7842 (p. 143).

Location.—Surface outcrop; in the SE. ¼ sec. 4, T. 129 N., R. 88 W., 9 miles east of Howe and 6½ miles north of Morristown (S. Dak.).

Lignite bed.—No name. Cretaceous or Tertiary age, Lance formation.

The bed was measured and sampled in 1909 by A. L. Beekly. The measurement showed 2 feet 6 inches of clear lignite at the point of sampling.

For chemical analyses of this lignite see part I of this bulletin, p. 143.

HOWE. EXPOSURE.

Sample.—Lignite; Standing Rock Reservation; analysis No. 7839 (p. 143).

Location.—Exposure in creek bank; on Cedar Creek near old Black Hills trail in the SW. ¼ sec. 12, T. 129 N., R. 88 W., 13 miles east of Howe. No railroad connection.

Lignite bed.—No name. Cretaceous or Tertiary age, Lance formation. The bed is about 3 feet thick at the point of sampling and lies nearly flat.

The bed was measured and sampled in 1909 by A. L. Beekly. The measurement showed 3 feet of clear lignite at the point of sampling.

For chemical analyses of this lignite see part I of this bulletin, p. 143.

STARK COUNTY.

LEHIGH. LEHIGH MINE.

Sample.—Lignite; Fort Union region (North Dakota No. 1; Pittsburg No. 13) analyses Nos. 1971 and 1972, and analyses Nos. 7537, 7538; p. 143.

Mine.—Lehigh; a drift mine at Lehigh, on the Northern Pacific Railroad.

Lignite bed.—The North Dakota lignite is of Tertiary (Eocene) age. The beds vary in thickness and few are continuous under large areas. Only one bed of workable proportions is known in the vicinity of Lehigh, this is said to show from 10 to 20 feet of clean lignite. The opening is on the outcrop, in a low bluff of Heart River. The bed lies nearly flat. At the points where samples were taken only the lower part of the bed, having a thickness of 6 feet 4 inches, is worked, but frequently an additional layer about 3 feet thick is taken down from the roof. The roof of the bed is fine clay.

Section A (sample 1971) was taken in entry 4, off south entry 2, at a place about 1,900 feet from the mouth of the mine, and included 5 feet of coal.

Section B (sample 1972) was taken at heading in north entry 1 at a place about 2,100 feet from the mouth of the mine and represented a 6½-foot cut.

Two samples were taken by M. R. Campbell on August 5, 1905, and by K. M. Way in March, 1909.

Sample 7537 was taken in 1908 from upper 7-foot bed in north entry 6, 3,300 feet from mouth.

Sample 7538 was taken in 1908 from upper 7-foot bed in south entry 4, 3,000 feet from mouth.

Notes.—In 1905 the lignite was mined and sold for steam and domestic use in towns along the Northern Pacific Railway in North Dakota. In winter the mine had in 1904 an output of about 350 tons a day. In summer the demand for fuel is light. The mine had then been opened about 20 years. The bed seemingly contains no bands nor partings of clay. In places there are incipient joints, along which "sulphur balls" are common.

For results of tests of this lignite see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 771; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 65; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 136; Bureau of Mines Bull. 13, pp. 170, 274; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1448; Bull. 261, p. 162; Bureau of Mines Bull. 14, pp. 33–34.

For chemical analyses of this lignite see part I of this bulletin, p. 143; also U. S. Geol. Survey Prof. Paper 48, p. 242; Bull. 261, p. 51; Bull. 290, p. 135; Bureau of Mines Bull. 14, p. 33.

WARD COUNTY.

TASKER. MCCLURE MINE.

Sample.—Lignite; (Pittsburg No. 15) analyses Nos. 7587, 7589 (p. 143).

Mine.—McClure; a drift mine at Tasker (Vanderwalker station), on the Minneapolis, St. Paul & Sault Ste. Marie Railway.

Lignite bed.—"Upper." Eocene age, Fort Union formation. The bed is about 5 feet 9 inches thick. Two feet of lignite is left in place for a roof. The floor is "black jack."

The bed was measured and sampled by K. M. Way on April 3, 1909, as shown below:

Sections of coal bed in McClure mine, at Tasker.

Laboratory No.	7587		7589	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Coal	0	9	0	10
Clay [a]	0	1	0	1
Coal	1	4	1	5
Clay [a]	0	1¼	0	1½
Coal	3	2	3	3½
Floor, black jack.				
Thickness of bed	5	5¼	5	9
Thickness of coal sampled	5	3	5	6½

[a] Not included in sample.

Sample 7587 was taken 2,700 feet west of opening in room 5 off west entry 5.

Sample 7589 was taken 2,000 feet north of opening in room 2 off north entry 6.

For results of briquetting tests of this coal see Bureau of Mines Bull. 14, p. 43.

For chemical analyses see part I of this bulletin, p. 143.

WILLIAMS COUNTY.

WILLISTON. WILLISTON PROJECT MINE

Sample.—Lignite; Williston field; analysis No. 5470 (p. 144).

Mine.—Williston project of the United States Reclamation Service; a drift mine 3 miles northeast of Williston, in sec. 8, T. 154 N., R. 100 W.

Lignite bed.—"Middle." Tertiary age, Fort Union formation. The bed is about 7 feet thick, with a shale roof and clay floor. It lies nearly flat. Two or three feet of lignite is left in place as a roof in mining.

The bed was measured and sampled by J. W. Groves on October 9, 1907. The sample represented 7 feet of clear lignite.

The sample was taken 250 feet east of opening in the main air course.

For chemical analyses of this lignite see part I of this bulletin, p. 144.

WILLISTON. BLACK DIAMOND MINE.

Sample.—Lignite; analyses Nos. 7600, 5469 (p. 144).

Mine.—Black Diamond; 3½ miles southeast of Williston, in T. 154 N., R. 100 W., on the Great Northern Railroad.

Lignite beds.—"Middle" and "Upper." Tertiary age, Fort Union formation. The beds are about 6 feet thick, with a clay floor and a roof; some of the lignite is left for a room in mining.

The bed was measured and sampled on October 9, 1907 (sample 5469), by J. W. Groves and on April 6, 1909 (sample 7600), by K. M. Way, as shown below:

Sections of lignite beds in Black Diamond mine, 3½ miles southeast of Williston.

Laboratory No.	5469		7600	
Roof, clay and coal.	*Ft.*	*in.*	*Ft.*	*in.*
Lignite	3	0	6	7½
Hard lignite[a]	0	8	..	..
Lignite	2	4	..	..
Floor, clay.				
Thickness of bed	6	0	6	7½
Thickness of lignite sampled	5	4	6	7½

[a] Not included in the sample, as it contains more sulphur than the rest of the bed.

Sample 5469 was taken from the "Middle" bed, 700 feet east of mine opening in main entry.

Sample 7600 was taken from the "Upper" bed in room 3, off west entry 1, on south entry 1.

Notes.—Some of the lignite in the roof may be recovered in drawing pillars; 22 inches of lignite is left up for roof at the point where sample 7600 was cut, and 3 feet was left as a roof at the point where sample 5469 was cut.

For chemical analyses of this coal see part I of this bulletin, p. 144.

WILLISTON. DRIFT MINE.

Sample.—Lignite; Williston field; (North Dakota No. 2) analysis No. 1730 (p. 144).

Mine.—A drift; at the mouth of Cedar Coulee, 4 miles southeast of Williston, not far from the line of the Great Northern Railroad.

Lignite bed.—The lignite beds of this field lie nearly horizontal, but are lenticular in shape. The lignite showing in Cedar Coulee is also visible in the bluff on the east side of Missouri River for a distance of 2 or 3 miles, but it is not of workable thickness across the river nor in the vicinity of Williston. The lignite in Cedar Coulee has a thickness of 9 to 12 feet, but only the bottom part is mined. Generally 6 or 7 feet is removed, the remainder being left as a roof in mining. The lignite has been used chiefly for domestic purposes. The mine was not in operation when the sample was collected.

One sample (No. 1730) was obtained in this mine by M. R. Campbell on July 13, 1905, at a point where about 150 feet from the mouth, and represented clean lignite 6 feet thick.

For results of tests of this lignite, see mention of specific tests as follows—Producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1187; Bull. 261, p. 104; Bull. 290, p. 137; Bureau of Mines Bull. 13, pp. 170, 275.

For chemical analyses see part I of this bulletin, p. 144; also U. S. Geol. Survey Prof. Paper 48, p. 243; Bull. 261, p. 51; Bull. 290, p. 137.

OHIO.

BELMONT COUNTY.

BELLAIRE. EMPIRE NO. 1 MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 12) analyses Nos. 3987, 3988 (p. 144).

Mine.—Empire No. 1; a drift mine at Bellaire, on the Baltimore & Ohio and the Pennsylvania Railroads.

Coal bed.—The bed worked at this mine is the No. 8 of the Ohio Geological Survey, corresponding to the Pittsburgh coal of Pennsylvania. It is of Carboniferous age, Monongahela formation. The thickness is fairly uniform, averaging 5 feet 5 inches at this mine. The bed lies nearly flat. The roof is a gray shale, which stands well. The floor is a gray shale, with fire-clay bottom. About 4 inches of poor coal is left on the bottom as a floor in mining. The coal bed has no persistent benches. Face and butt joints are well developed.

The bed was measured and sampled at four points in the mine by J. W. Groves and K. M. Way, October 19, 1906, as shown below:

Sections of coal bed in Empire No. 1 mine at Bellaire.

Section	A		B	
Laboratory Nos	3987		3988	
Roof: Section A, shale; section B, coal and slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	4	2	7
Shale [a]	0	¾	0	½
Coal	0	9¾	1	4½
Sandstone [a]	0	¾	..	..
Shale [a]	..	..	0	1
Coal	0	8½	0	11
Shale [a]	0	1	..	..
Coal (bottom) [a]	..	..	0	4½
Coal	1	2	..	..
Coal (bottom) [a]	0	4	..	..
Floor, shale.				
Thickness of bed	5	6¾	5	4½
Thickness of coal sampled	5	¼	4	10½

[a] Not included in sample.

Section A (sample 3987) was measured in room 3, off west entry 4.

Section B (sample 3988) was measured in room 24, off entry 10.

Note.—The approximate average output of this mine in 1906 was 1,000 tons per day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 191; Bureau of Mines Bull. 23, pp. 66, 176; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 191; Bureau of Mines Bull. 13, pp. 180, 275; washing tests: U. S. Geol. Survey Bull. 332, p. 192; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 193; Bull. 336, pp. 23, 31, 40.

For chemical analyses see part I of this bulletin, p. 144; also U. S. Geol. Survey Bull. 332, p. 191.

BETHESDA. BADGERTOWN MINE.

Sample.—Bituminous coal; Ohio field; analysis No. 4053 (p. 145).

Mine.—Badgertown; a small mine 1 mile northwest of Bethesda.

Coal bed.—Meigs Creek. Carboniferous age, Monongahela formation

The bed was measured and sampled by W. T. Griswold on October 17, 1906, as described below:

Section of coal bed in Badgertown mine, 1 mile northwest of Bethesda.

Laboratory No.	4053	
	Ft.	*in.*
Coal	2	9½
Shale [a]	0	1
Coal	2	4
Thickness of bed	5	2½
Thickness of coal sampled	5	1½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 145.

FLUSHING. WHITE MINE.

Sample.—Bituminous coal; Ohio field; analysis No. 4054 (p. 145).

Mine.—White; 1 mile southeast of Flushing.

Coal bed.—Meigs Creek. The coal is of Carboniferous age, Monongahela formation. The bed was measured and sampled by W. T. Griswold on October 16, 1906. The sample represented 4 feet of clear coal. No record of the section was kept.

For chemical analyses of this coal see part I of this bulletin, p. 145.

FLUSHING. BLACK OAK MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 11) analyses Nos. 3985, 3986 (p. 145).

Mine.—Black Oak, a shaft mine 2 miles southeast of Flushing, on the Baltimore & Ohio Railroad.

Coal bed.—No. 8 of the Ohio Geological Survey, corresponding to the Pittsburgh coal of Pennsylvania. Carboniferous age, Monongahela formation. Thickness, fairly uniform, averaging 4 feet 10 inches at this mine. The bed lies nearly flat, under about 90 feet of cover. Above the coal worked is about 8 inches of roof coal. The floor is a very hard clay. Below the fire clay is limestone.

The bed was measured and sampled at two points in the mine by J. W. Groves and K. M. Way on October 17, 1906, as shown below:

Sections of coal bed in Black Oak mine, 2 miles southeast of Flushing.

Section	A		B	
Laboratory No.	3985		3986	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Coal	[a] 0	2	1	11
Shale	[a] 0	2	[a] 0	¾
Coal	1	4	1	3
Shale	[a] 0	1½	..	..
Mother coal	..	..	0	¼
Coal	[a] 0	2½	0	8
Shale	[a] 0	½	[a] 0	1
Coal	1	6	1	1
Shale	0	¼	..	..
Coal	1	2	..	..
Floor, fire clay.				
Thickness of bed	4	8¾	5	1
Thickness of coal sampled	4	¼	4	11¼

[a] Not included in sample.

Section A (sample 3985) was measured in the second south face, off third west butt entry, 2,000 feet west of the shaft.

Section B (sample 3986) was measured in room 7, off the 00 butt entry, off the first south face, 1,500 feet southwest of the shaft.

Note.—The average daily output of this mine in 1906 was 1,500 tons.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 189; Bureau of Mines Bull. 23, pp. 66, 176; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 190; Bureau of Mines Bull. 13, pp. 180, 275.

For chemical analyses see part I of this bulletin, p. 145; also U. S. Geol. Survey Bull. 332, p. 189.

NEFFS. NEFF NO. 1 MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 6) analyses Nos. 2095, 2096 (p. 145).

Mine.—Neff No. 1; a drift mine at Neffs, on the Baltimore & Ohio Railroad.

Coal bed.—No. 8 of the Ohio Geological Survey; corresponds with the Pittsburgh coal of Pennsylvania. Carboniferous age, Monongahela formation. Thickness, fairly uniform, at this mine about 6 feet. The bed lies nearly flat. The roof of the main bed of coal is a band of shale 8 to 20 inches thick, averaging 10 inches, that in most places is taken down, but in some is used as a roof. Above this shale is bony coal 4 to 24 inches thick, averaging 8 inches, that forms the roof in most of the mine. The floor is a black shale. The bed at this mine carries a fairly regular band of shale or sulphur, and a number of small partings of mother coal, shale, and sulphur.

The bed was measured and sampled at two points by W. J. von Borries and J. W. Groves on September 2, 1905, as shown below:

Sections of coal bed in Neff No. 1 mine, at Neffs.

Section	A		B	
Laboratory No	2095		2096	
Roof: section A, coal; section B, soapstone.	*Ft.*	*in.*	*Ft.*	*in*
Soapstone [a]	0	10	..	..
Coal	1	2	1	11
Sulphur and mother coal	..	..	..	⅛
Shale	0	⅛	..	..
Coal	0	9	0	5
Shale	..	..	0	½
Niggerhead	0	⅛	..	..
Coal	0	4	1	3
Mother coal	..	..	0	⅛
Shale	0	¼	..	..
Coal	1	5½	0	10
Sulphur [a]	0	1½	0	1
Coal	1	3	1	3
Bony coal [a]	..	..	0	5
Floor, shale.				
Thickness of coal bed	5	11½	6	2¾
Thickness of coal sampled	5	0	5	8¾

[a] Not included in sample.

Section A (sample 2095) was measured in room 12, off east entry 4, 2,000 feet southeast of the mine mouth.

Section B (sample 2096) was measured in room 3, off west entry 2, 1,000 feet southwest of the mine mouth.

Note.—The coal mined is hard and brittle.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 154; Bureau of Mines Bull. 23, pp. 66, 174; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 155; Bureau of Mines Bull. 13, pp. 174, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 156; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 156; Bull. 336, pp. 23, 31, 40; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 54, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 145; also U. S. Geol. Survey Bull. 290, p. 154.

GUERNSEY COUNTY.

DANFORD. FORSYTHE MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 7) analyses Nos. 2090, 2091 (p. 145).

Mine.—Forsythe; a slope mine at Danford, on the Baltimore & Ohio Railroad.

Coal bed.—No. 7 of the Ohio Geological Survey. Carboniferous age, Allegheny formation. Its thickness is fairly uniform, averaging at this mine about 6 feet. The bed lies nearly flat. The roof is a massive gray shale. The floor is shale. The bed carries a regular shale band near the bottom, and irregular mother coal and "sulphur" partings.

The bed was measured and sampled at two points in the mine by J. W. Groves on September 5, 1905, as shown below:

Sections of coal bed in Forsythe mine, at Danford.

Section	A		B	
Laboratory No.	2090		2091	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	10	0	11
Niggerhead[a]	0	1¼	..	..
Mother coal	..	..	0	⅛
Coal	0	6	1	6
Mother coal and sulphur	0	¼	..	..
Mother coal	..	..	0	⅛
Coal	0	5½	0	7
Shale[a]	0	1	..	..
Niggerhead[a]	..	..	0	1
Coal	0	2	1	3
Shale	[a] 0	2½	0	¼
Coal	1	3	0	1
Shale[a]	..	..	0	2½
Coal	..	..	1	6
Floor, shale.				
Thickness of coal bed	5	7½	6	2
Thickness of coal sampled	5	2¾	5	10½

[a] Not included in sample.

Section A (sample 2090) was measured in room 1, off east entry 16, 2,600 feet northwest of the bottom of the slope.

Section B (sample 2091) was measured in room 22, off east entry 14, 3,700 feet northeast of the bottom of the slope.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 157; Bureau of Mines Bull. 23, pp. 66, 174; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 158; Bureau of Mines Bull. 13, pp. 180, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 159; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 159; Bull. 336, pp. 23, 31, 40; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 54, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 145; also U. S. Geol. Survey Bull. 290, p. 157.

HARRISON COUNTY.

FLUSHING. DUNLAP MINE.

Sample.—Bituminous coal; Ohio field; analysis No. 4056 (p. 145).

Mine.—Dunlap; 2 miles north of Flushing. No railroad connection.

Coal bed.—Meigs Creek. Carboniferous age, Monongahela formation.

The bed was measured and sampled on October 16, 1906, by W. T. Griswold, as shown below:

Section of coal bed in Dunlap mine, 2 miles north of Flushing.

Laboratory No	4056	
	Ft.	*in.*
Roof, clay.		
Coal	0	7
Smut[a]	0	½
Coal	4	0
Thickness of bed	4	7½
Thickness of coal sampled	4	7

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 145.

HOCKING COUNTY.

JOBS. NO. 2 MINE.

Sample.—Bituminous coal; Ohio field; analysis No. 7712 (p. 146).

Mine.—No. 2; Hocking field; in sections 2 and 8, T. 13, R. 15, at Jobs, Ward township.

Coal bed.—No. 6 (Middle Kittanning). Carboniferous age, Allegheny formation.

The bed was measured and sampled by G. H. Dukes, as shown below:

Section of coal bed in No. 2 mine, at Jobs.

Laboratory No	7712	
	Ft.	*in.*
Bone coal[a]	0	6
Top coal	1	8
Gray coal, soft and sulphurous[a]	0	8
Slate[a]	0	4
Middle bench	1	6
Slate[a]	0	1
Bottom bench	1	6
Floor, fire clay.		
Thickness of bed	6	3
Thickness of coal sampled	4	8

[a] Not included in sample.

The sample was taken from the second breakthrough, between rooms 3 and 4, off west entry 4, off south entry 3, 4,600 feet from drift mouth. The sample was taken according to the standard method of the Bureau of Mines, but the collector was not connected with the Bureau of Mines nor with the United States Geological Survey.

For chemical analyses of this coal see part I of this bulletin, p. 146.

JACKSON. DECATUR NO. 1 MINE.

Sample.—Bituminous coal; Ohio field; analyses Nos. 15188, 15189 (p. 146).

Mine.—Decatur No. 1; 5 miles west of Jackson.

Coal bed.—No. 1. Carboniferous age, Allegheny formation.

The bed was measured and sampled at two points by K. M. Way, July 11, 1907.

Sample 15188 was taken in room 4, off left heading 3, 650 feet northwest of opening. It represented 3 feet ¾ inch of coal, the thickness of the bed.

Sample 15189 was taken in room 10, off left entry 1, 600 feet northwest of opening. It represented 2 feet 9¾ inches of coal, the thickness of the bed.

JACKSON COUNTY.

WELLSTON. NO. 10 MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 1) analyses Nos. 1896 and 1897 and (Ohio No. 2) analyses Nos. 1898 and 1899 (p. 146).

Mine.—No. 10; a drift mine 9 miles southeast of Wellston, on the Baltimore & Ohio Railroad.

Coal beds.—No. 4 and No. 5 of the Ohio Geological Survey. Carboniferous age, Allegheny formation. Thickness, fairly uniform; dip, nearly flat.

The No. 4 bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on July 26, 1905, as described below:

Sections of No. 4 coal bed in No. 10 mine, 9 miles southeast of Wellston.

Section	A		B	
Laboratory No.	1896		1897	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	1	6
Shale [a]	0	11	..	..
Shale, sulphur and fire clay [a]	..	..	0	10
Coal	1	3	1	2
Shale [a]	0	2	..	..
Shale and sulphur [a]	..	..	0	1
Coal	0	3	0	3
Shale [a]	0	1½	..	..
Sulphur	..	..	0	¼
Coal	0	9	0	9
Floor, clay.				
Thickness of bed	4	11½	4	7¼
Thickness of coal sampled	3	9	3	8¼

[a] Not included in sample.

Section A (sample 1896) was measured in room 16, off right entry 4, south, 1,400 feet southwest of the mine entrance.

Section B (sample 1897) was measured at the face of room 17, off right entry 4, north, 1,400 feet northeast of the mine entrance.

The No. 5 bed was measured and sampled at two points by W. J. von Borries and J. W. Groves on July 26, 1905, as described below:

Sections of No. 5 coal bed in No. 10 mine, 9 miles southeast of Wellston.

Section	A		B	
Laboratory No.	1898		1899	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	2	2	3
Sulphur	0	⅛	..	..
"Horn"	..	..	[a] 0	1¼
Coal	1	1	[a] 0	5
"Horn"	[a] 0	1½	..	..
Clay	..	..	[a] 0	1
Coal	0	5	0	4
Clay	[a] 0	1¼	..	..
Coal	0	4	..	..
"Horn"	[a] 0	2½	..	..
Floor, fire clay.				
Thickness of bed	3	5⅜	3	2¼
Thickness of coal sampled	3	⅛	2	7

[a] Not included in sample.

Section A (sample 1898) was measured in room 5, off right entry 2, on the south side of the mine, 800 feet southwest of the opening.

Section B (sample 1899) was measured in room 7, off right entry 4, on the north side of the mine, 800 feet northeast of the opening.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, pp. 140, 143; Bureau of Mines Bull. 23, pp. 65, 172, 173; washing tests: U. S. Geol. Survey Bull. 290, pp. 141, 144; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, pp. 142, 144; Bull. 336, pp. 23, 31, 40.

For chemical analyses see part I of this bulletin, p. 146; also U. S. Geol. Survey Bull. 290, pp. 140, 142.

JEFFERSON COUNTY.

BRADLEY. CROW HOLLOW MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 4) analyses Nos. 1910, 1911 (p. 146).

Mine.—Crow Hollow; a drift mine at Bradley, on the Baltimore & Ohio Railroad.

Coal bed.—No. 8 of the Ohio Geological Survey; correlated with the Pittsburgh bed of Pennsylvania. Carboniferous age, Monongahela formation. Thickness, fairly uniform; dip, nearly flat; roof, coal and "soapstone;" floor, clay.

The bed was measured and sampled at two points by J. W. Groves and W. J. Von Borries on July 31, 1905, as described below:

Sections of coal bed in Crow Hollow mine, at Bradley.

Section	A		B	
Laboratory No.	1910		1911	
Roof: section A, coal; section B, soapstone.	*Ft.*	*in.*	*Ft.*	*in.*
"Draw slate" [a]	0	11	..	..
Soapstone [a]	..	..	1	4
Coal	1	8	1	8
Mother coal	0	⅛	..	..
Mother coal and sulphur	..	..	0	⅛
Coal	0	9	0	8
Blue band [a]	0	3	0	2
Coal	1	2	0	8
Sulphur	0	¼	..	..
Mother coal	..	..	0	⅛
Coal	0	6	1	5
Sulphur	0	¼	..	..
Coal	0	6	..	..
Floor, clay.				
Thickness of coal bed	5	9⅝	5	11¼
Thickness of coal sampled	4	7⅝	4	5¼

[a] Not included in sample.

Section A (sample 1910) was measured in room 9, off left entry 4, in district 9, 3,000 feet northwest of the tipple.

Section B (sample 1911) was measured in room 17, off main entry 2, in district 2.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 148; Bureau of Mines Bull. 23, pp. 66, 173; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 149; Bureau of Mines Bull. 13, pp. 174, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 150; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 150; Bull. 336, pp. 23, 31, 40.

For chemical analyses see part I of this bulletin, p. 146; also U. S. Geol. Survey Bull. 290, p. 147.

BRILLIANT. COUNTRY BANK (?).

Sample.—Bituminous coal; Ohio field; analysis No. 1577 (p. 147).

Location.—Country bank (?); at Brilliant.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled by W. T. Griswold in 1904. No record of the section is available.

For chemical analyses of this coal see part I of this bulletin, p. 147; also U. S. Geol. Survey Prof. Paper 48, p. 272.

GEORGES RUN. WAUGH'S BANK.

Sample.—Bituminous coal; Ohio field; analysis No. 1576 (p. 147).

Location.—Waugh's country bank, 1 mile west of Ohio River, at mouth of Georges Run.

Coal bed.—Pittsburg. Carboniferous age, Monongahela formation. Thickness, at this bank, 5 feet.

The bed was measured and sampled by W. T. Griswold in 1904, as shown on the following page.

Section of coal bed in Waugh's country bank at Georges Run.

Laboratory No	1576	
	Ft.	*in.*
Coal	2	2½
Parting [a]	0	½
Coal	0	2½
Parting [a]	0	½
Coal	2	6
Thickness of bed	5	0
Thickness of coal sampled	4	11

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 147.

ISLAND CREEK. COUNTRY BANK.

Sample.—Bituminous coal; Ohio field; analysis No. 1574 (p. 147).

Location.—Country bank, at Island Creek, 1 mile west of Ohio River.

Coal bed.—Finley. Carboniferous age, Monongahela (?) formation. Thickness, at this bank, 4 feet 2 inches with thin parting.

The bed was measured and sampled by W. T. Griswold in 1904, as shown below:

Section of coal bed in country bank at Island Creek.

Laboratory No	1574	
	Ft.	*in.*
Coal	1	5
Parting [a]	0	½
Coal	2	8½
Thickness of bed	4	2
Thickness of coal sampled	4	1½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 147.

NEW ALEXANDRIA. SCOTT'S BANK.

Sample.—Bituminous coal; Ohio field; analysis No. 1575 (p. 147).

Location.—Scott's bank, 1 mile north of New Alexandria.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled by W. T. Griswold, as shown below:

Section of coal bed in Scott's bank at New Alexandria.

Laboratory No	1575	
	Ft.	*in.*
Coal	0	9
Parting [a]	0	1
Coal	0	7
Parting [a]	0	½
Coal	2	8½
Thickness of bed	4	2
Thickness of coal sampled	4	½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 147; also U. S. Geol. Survey Prof. Paper 48, p. 272.

RUSH RUN. RUSH RUN NO. 1 MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 5) analyses Nos. 1944, 1945 (p. 147).

Mine.—Rush Run No. 1; a drift mine at Rush Run, on the Pennsylvania Railroad.

Coal bed.—No. 8 coal of the Ohio Geological Survey, corresponding to the Pittsburgh bed of Pennsylvania. Carboniferous age, Monongahela formation. Thickness, fairly uniform, being about 4 feet 8 inches at this mine; dip, slight; roof, coal; floor, shale.

The bed was measured and sampled at two points by J. W. Groves on August 1, 1905, as described on the following page.

Sections of coal bed in Rush Run No. 1 mine, at Rush Run.

Section	A		B	
Laboratory No.	1944		1945	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3	1	4
Sulphur	0	⅛	..	..
Mother coal	..	..	0	¼
Coal	0	11	0	9
Shale and coal[a]	0	3	..	..
Band (shale)[a]	..	..	0	2
Coal	1	2	0	2
Shale	0	⅛	..	..
Sulphur[a]	..	..	0	1
Coal	0	11	0	11
Shale	..	..	0	⅛
Coal	..	..	1	0
Floor, shale.				
Thickness of bed	4	6¼	4	5⅜
Thickness of coal sampled	4	3¼	4	2⅜

[a] Not included in sample.

Section A (sample 1944) was measured in room 5, off left entry 1, 2,400 feet southeast of the drift mouth.

Section B (sample 1945) was measured in the face of room 17, off entry 3, 2,600 feet south of the drift mouth.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 151; Bureau of Mines Bull. 23, pp. 66, 174; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 152; Bureau of Mines Bull. 13, pp. 174, 275; coking tests: U. S. Geol. Survey Bull. 290, p. 153; Bull. 336, pp. 23, 31, 40; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 54, 56, 59, 62.

For chemical analyses see part I of this bulletin, p. 147; also U. S. Geol. Survey Bull. 290, p. 151.

PERRY COUNTY.

DIXIE. DIXIE MINE.

Sample.—Bituminous coal; Ohio field (Ohio No. 8); analyses 2119, 2120 (p. 147).

Mine.—Dixie, a drift mine in the Hocking Valley district, at Dixie, on the Baltimore & Ohio Railroad.

Coal bed.—No. 6, or Hocking coal of the Ohio State geological survey, locally known as the 6-foot bed. Carboniferous age, Allegheny formation. The workable portion of the bed is about 4 feet to 4 feet 6 inches thick. The bed lies nearly flat with many local variations in dip. The roof of the coal that is worked is the "Big Slate." This is a layer of shale 4 to 6 inches thick, above which is about a foot of bony coal. The shale and the bony coal are taken down to give sufficient height in mining. Above the bony coal, forming the true roof of the bed, is massive gray shale. The floor is clay. The bed carries partings of shale and mother coal.

The bed was measured and sampled at two points in the mine by J. W. Groves on September 7, 1905, as shown below:

Sections of coal bed in Dixie mine, at Dixie.

Section	A		B	
Laboratory No.	2119		2120	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal[a]	0	10½	1	..
Shale[a]	0	3	0	5
Coal	0	7	0	2
Mother coal	0	¼	0	¼
Coal	0	9	1	0
Shale[a]	0	2	0	1½
Coal	1	7	1	10
Floor, clay.				
Thickness of bed	4	2¾	4	6¾
Thickness of coal sampled	2	11¼	3	¼

[a] Not included in sample.

Section A (sample 2119) was measured in the first pair of east entries, 1,000 feet southeast of the drift mouth.

Section B (sample 2120) was measured in the first pair of west entries, 1,000 feet southwest of the drift mouth.

Note.—The coal from this mine, like that from other mines working the No. 6 bed in this field, is hard and brittle.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 160; Bureau of Mines Bull. 23, pp. 66, 174; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 161; Bureau of Mines Bull. 13, pp. 180, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 162; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 162; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 54, 56, 59, 63.

For chemical analyses see part I of this bulletin, p. 147; also U. S. Geol. Survey Bull. 290, p.160.

Shawnee. Gosline & Barbour Mine.

Sample.—Bituminous coal; Ohio field; (Ohio No. 3) analyses Nos. 1900, 1901 (p. 147).

Mine.—Gosline & Barbour, a drift mine in the Hocking Valley district, at Shawnee, on the Zanesville & Western Railroad.

Coal bed.—No. 6 or Hocking of the Ohio Geological Survey. Carboniferous age, Allegheny formation. Thickness, fairly uniform; dip, nearly flat. Roof, shale; floor, clay.

The bed was measured and sampled at two points by J. W. Groves and W. J. Von Borries on July 28, 1905, as described below:

Sections of coal bed in Gosline & Barbour mine, at Shawnee.

Section	A		B	
Laboratory No.	1900		1901	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8	0	4
Shale	[a] 0	4	0	⅛
Coal	1	2	1	3
Shale	[a] 0	1½	[a] 0	3
Coal	2	1	1	2
Shale	..	..	[a] 0	1
Coal	..	..	2	1
Floor, fire clay.				
Thickness of bed	5	4½	5	2⅛
Thickness of coal sampled	4	11	4	10⅛

[a] Not included in sample.

Section A (sample 1900) was measured in the main entry, 500 feet northeast of the drift mouth.

Section B (sample 1901) was measured in the face of entry No. 7, 300 feet northeast of the drift mouth.

Note.—This mine in 1905 was working in a small way the crop of the No. 6 bed to supply a brick plant.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 145; Bureau of Mines Bull. 23, pp. 66, 173; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 146; Bureau of Mines Bull. 13, pp. 174, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 147; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 147; Bull. 336, pp. 23, 31, 40.

For chemical analyses see part I of this bulletin, p. 147; also U. S. Geol. Survey Bull. 290, p. 145.

TUSCARAWAS COUNTY.

MINERAL CITY. HUFF MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 10) analyses Nos. 3968, 3969 (p. 148).

Mine.—Huff; a drift mine at Mineral City, on the Baltimore & Ohio Railroad.

Coal bed.—No. 5 of the Ohio Geological Survey. Carboniferous age, Allegheny formation. The bed is of fairly uniform thickness, averaging 3 feet 5 inches at this mine. It lies nearly flat. The roof is a hard gray shale; the floor is fire clay. The bed carries "sulphur" and shale partings.

The bed was measured and sampled at two points in the mine by J. W. Groves and K. M. Way on October 15, 1906, as shown below:

Sections of coal bed in Huff mine at Mineral City.

Section	A		B	
Laboratory No.	3968		3969	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	5	0	2
Sulphur	0	1/8	[a] 0	1/4
Coal	1	6½	1	6
Black band	0	½	..	..
Sulphur	..	..	0	1/8
Coal	0	5	0	10½
Sulphur	[a] 0	1/4	..	..
Black band	..	..	[a] 0	2¼
Coal	0	6	0	10¾
Floor, fire clay.				
Thickness of bed	2	11⅜	3	7⅞
Thickness of coal sampled	2	11	3	5⅜

[a] Not included in sample.

Section A (sample 3968) was measured in room 4, off west entry 16, 7,000 feet southeast of the drift mouth.

Section B (sample 3969) was measured in room 7, off east entry 16, 6,600 feet southeast of the drift mouth.

Note—The average daily output of the mine in 1905 was 300 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 188; Bureau of Mines Bull. 23, pp. 66, 175; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 188; Bureau of Mines Bull. 13, pp. 180, 275.

For chemical analyses see part I of this bulletin, p. 148; also U. S. Geol. Survey Bull. 332, p. 187.

VINTON COUNTY.

CLARION. CLARION MINE.

Sample.—Bituminous coal; Ohio field; (Ohio No. 9) analyses Nos. 2208, 2209 (p. 148).

Mine.—Clarion; a drift mine in the Hocking Valley district, at Clarion, on the Hocking Valley Railway.

Coal bed.—No. 4 of the Ohio Geological Survey. Carboniferous age, Allegheny formation. Thickness, fairly uniform, averaging at this mine a little over 4 feet. The bed lies nearly flat. The roof is of sandy shale, about 1 foot thick. The floor is clay, 3 to 5 feet thick. The bed carries a regular bone and shale parting, and other partings that are irregular.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on September 25, 1905, as shown below:

Sections of coal bed in Clarion mine at Clarion.

Section	A		B	
Laboratory No	2208		2209	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	0	10
Bone coal[a]	0	2½	..	..
Sulphur[a]	..	..	0	½
Shale[a]	0	5½	..	..
Coal	1	1	1	0
Bone coal[a]	..	..	0	2
Shale[a]	0	2	0	5½
Coal	1	0	0	11
Shale[a]	..	..	0	3
Coal	..	..	0	7½
Floor, fire clay.				
Thickness of bed	4	5	4	3½
Thickness of coal sampled	3	7	3	4½

[a] Not included in sample.

Section A (sample 2208) was measured in room 6, off east entry 4, 900 feet northeast of the drift mouth.

Section B (sample 2209) was measured in butt entry 5, off the main entry, 800 feet west of the drift mouth.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 163; Bureau of Mines Bull. 23, pp. 66, 174; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 165; Bureau of Mines Bull. 13, pp. 180, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 165; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 166; Bull. 336, pp. 23, 31, 40; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 50, 54, 56, 59, 63.

For chemical analyses see part I of this bulletin, p. 148; also U. S. Geol. Survey Bull. 290, p. 163.

OKLAHOMA.

COAL COUNTY.

Lehigh. No. 5 Mine.

Sample.—Bituminous coal; Oklahoma field; (Indian Territory No. 4) analyses Nos. 1150, 1151 (p. 149).

Mine.—No. 5; Lehigh district; a shaft mine ½ mile north of Lehigh, on the Missouri, Kansas & Texas Railway.

Coal bed.—The McAlester coal, which is one of the prominent beds of the McAlester coal field. Lehigh and Coalgate are on the west side of the basin, and the coal dips generally to the east as low as 4°. The deepest cover at this mine is over 200 feet, the main shaft being 240 feet deep.

The bed was measured and sampled at two points by J. W. Groves in 1904, as shown below:

Section of coal bed in No. 5 mine, at Lehigh.

Section	A		B	
Laboratory No	1150		1151	
	Ft.	*in.*	*Ft.*	*in.*
Bony coal[a]	0	4	0	4
Coal	4	0	4	10
Thickness of bed	4	4	5	2
Thickness of coal sampled	4	0	4	10

[a] Not included in sample.

Section A was measured in south entry 8, in slope 5, and section B was measured in the north entry 3 in the south slope.

Notes.—The coal from this mine, like that from others in this district, is rather friable. In 1904 the rated capacity of the mine was about 750 tons per day. Practically the entire output was shipped to Texas, where it was used by several railroads for locomotives.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 521; Bull. 261, p. 81; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1111.

For chemical analyses see part I of this bulletin, p. 149; also U. S. Geol. Survey Prof. Paper 48, p. 218; Bull. 261, p. 40.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

LEHIGH. LEHIGH NO. 8 MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 10054 (p. 149).

Mine.—Lehigh No. 8; Lehigh district, in Boone township, 1½ miles southeast of Lehigh.

Coal bed.—McAlester. The coal is of Carboniferous (Allegheny) age, McAlester (?) formation. The bed is 4 feet 7 inches thick, the top 3 inches and bottom 4 inches of which is bony coal.

The bed was measured and sampled on February 23, 1910, by L. M. Jones, as described below:

Section of coal bed in Lehigh No. 8 mine, 1½ miles southeast of Lehigh.

Laboratory No.	10054	
	Ft.	*in.*
Bony coal [a]	0	3
Hard bright coal	1	7½
Soft bright coal	0	4
Hard bright coal	0	3
Sulphur band	0	1
Hard bright coal	1	8½
Bony coal [a]	0	4
Thickness of bed	4	7
Thickness of coal sampled	4	0

[a] Not included in sample.

Sample was taken in face of room 19, north entry 3, 2,000 feet northwest of shaft.

Note.—The daily output of the mine in 1910 was 600 tons.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

HASKELL COUNTY.

CHANT. SAN BOIS NO. 2 MINE.

Sample.—Bituminous (coking) coal; McAlester field; analysis No. 10057 (p. 149).

Mine.—San Bois No. 2; San Bois district; a slope mine ½ mile east of Chant, on the Fort Smith & Western Railway.

Coal bed.—Known in this field as the McCurtain (Hartshorne). Carboniferous (Allegheny) age, McAlester shale. The coal at this mine has an average thickness of 6 feet 6 inches; a shale roof of medium quality; and a floor of hard clay with smooth surface. It dips 7° S.

The bed was measured and sampled at one point by L. M. Jones, March 2, 1910, as described below:

Section of coal bed in San Bois No. 2 mine, one-half mile east of Chant.

Laboratory No	10057
	Ft. in.
Roof, slate.	
Soft coal	2 2
Hard shale[a]	0 5
Soft friable coal	4 4
Floor, hard clay.	
Thickness of bed	6 11
Thickness of coal sampled	6 6

[a] Not included in sample.

Section A (sample 10057), was cut from the face of south entry 10, 2,700 feet southeast of the opening.

Notes.—In 1910 the coal was not undercut but was shot off the solid with black powder in the rooms. The tipple was provided with bar screens, and the entire output of the mine was screened. The coal was picked on the cars by three trimmers. The screenings were washed and coked, there being 210 ovens at this plant. The tipple had a storage-bin capacity of 1,000 tons. The average daily tonnage was 600 tons. The future output was to be derived two-thirds from advance work and one-third from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

LATIMER COUNTY.

HUGHES. TURKEY CREEK MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1817 (p. 149).

Mine.—Turkey Creek; in the SE. ¼ sec. 33, T. 6 N., R. 22 E., at Hughes.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler. The sample included a 30-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

LUTIE. HAILEY-OLA MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1818 (p. 149).

Mine.—Hailey-Ola; in sec. 11, T. 5 N., R. 19 E., at Lutie.

Coal bed.—Lower Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled by M. K. Shaler. The sample included a 65-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

WILBURTON. NO. 2 MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1769 (p. 149).

Mine.—No. 2; in sec. 10, T. 5 N., R. 19 E., at Wilburton.

Coal bed.—Upper Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler, the sample representing a 50-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

WILBURTON. WILBURTON NO. 6 AND NO. 7 MINES.

Sample.—Bituminous coal; McAlester field; analyses Nos. 1770, 1771 (p. 149).

Mine.—Wilburton No. 6 and No. 7; in sec. 8, T. 5 N., R. 19 E., 1 mile west of Wilburton.

Coal bed.—Upper and Lower Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler.

Sample 1770 was taken from the Upper Hartshorne bed in mine No. 6, and represented a 50-inch cut.

Sample 1771 was taken from the Lower Hartshorne bed in mine No. 7, from east entry 5, and represented a 46-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

LA FLORE COUNTY.

HOWE. MEXICAN GULF MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1815 (p. 149).

Mine.—Mexican Gulf in the S. ½ sec. 2, T. 5 N., R. 25 E., 2 miles south of Howe.

Coal bed.—Lower Hartshorne. The coal is of Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler. The sample included a 45-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

HUGHES. NO. 2 MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 10065 (p. 149).

Mine.—No. 2; in sec. 4, T. 5 S., R. 22 E., 1 mile southwest of Hughes.

Coal bed.—Lower Hartshorne. The coal is of Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled on March 8, 1910, by L. M. Jones, and measured 4 feet 2 inches; the sample included 3 feet 7½ inches of dirty coal. The sample was taken in face of room 20, west entry 4, northwest of slope mouth.

Note.—The daily output of the mine in 1910 was 200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

HUGHES. PROSPECT.

Sample.—Bituminous coal; McAlester field; analysis No. 1816 (p. 149).

Location.—Prospect in the E. ½ sec. 4, T. 5 N., R. 22 E., 2 miles southwest of Hughes.

Coal bed.—Lower Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler. The sample included a 46-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 149.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

OKMULGEE COUNTY.

HENRYETTA. HENRYETTA NO. 1 MINE.

Sample.—Bituminous coal; Henryetta field; (Indian Territory No. 1), analyses Nos. 1059, 1060 (p. 150).

Mine.—Henryetta No. 1; a shaft mine in the Henryetta district, at Henryetta, on the St. Louis & San Francisco Railroad.

Coal bed.—Henryetta. Carboniferous (Allegheny) age, in the Cherokee shale. Thickness, fairly uniform, averaging about 3 feet; dip, very gentle to the southwest; roof of shale (?); floor of fire clay (?); cover 100 to 150 feet thick.

The bed was measured and sampled at two points by J. S. Burrows on September 5, 1904, as shown below.

Sections of coal bed in Henryetta No. 1 mine at Henryetta.

Section	A		B	
Laboratory No.	1060		1059	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	3	1	7
Mother coal	0	3½	0	4
Coal	1	5	1	3
Thickness of bed	2	11½	3	2
Thickness of coal	2	11½	3	2

Section A (sample 1060) was measured in the face of the northeast entry.

Section B (sample 1059) was measured in the face of the southeast entry.

Notes.—Much of the slack comes from the band of mother coal (that resembles crushed charcoal) in the middle of the bed. It falls into fine powder. The rated capacity of the mine in September, 1904, was 75 tons per day, the mine having been opened only five months. Most of the product was shipped to points in Texas and Oklahoma for domestic fuel. Some was used by locomotives.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 497; Bull. 261, p. 81; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1098; Bull. 261, p. 98; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1337; Bull. 261, p. 123.

For chemical analyses see part I of this bulletin, p. 150; also U. S. Geol. Survey Prof. Paper 48, p. 214; Bull. 261, p. 39.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

HENRYETTA. VICTORIA NO. 1 MINE.

Sample.—Bituminous coal; Henryetta field; analyses Nos. 10177, 10178 (p. 150).

Mine.—Victoria No. 1; a shaft mine, 335 feet in depth, 4¾ miles west of Henryetta on the Atchison, Topeka & Santa Fe Railway.

Coal bed.—Known in this field as the Henryetta. Carboniferous (Allegheny) age, in the Cherokee shale. The coal at this mine has an average thickness of 2 feet 10 inches, with a good shale roof of smooth surface; floor, medium hard clay.

The bed was measured and sampled at two points by L. M. Jones on March 16, 1910, as described below:

Section of coal bed in No. 1 mine, 4¾ west of Henryetta.

Laboratory No.	10178	
	Ft.	*in.*
Roof, shale.		
Soft bright coal	1	3
Slate [a]	0	½
Soft bright coal	0	2½
Slate [a]	0	½
Soft bright coal	1	4
Floor, medium hard clay.		
Thickness of bed	2	10½
Thickness of coal sampled	2	9½

[a] Not included in sample.

Section A (sample 10178) was cut from the face west entry 1, 200 feet from the shaft.

Section B (sample 10177) was cut from the main east entry and included a 34-inch cut.

Notes.—In 1910 the coal at this mine was not undercut, but was shot off the solid with black powder. The tipple was provided with shaking screens with 2-inch and ¾-inch holes. The proportion of screenings to the entire output was about 25 per cent. The coal was picked on the car by one trimmer. The average daily tonnage was 75 tons. The arrangement of the mine was such that 1,000 tons of coal per day could be handled. There were 620 acres to be mined. This was practically a new mine, and development work was going on. The future output was to be derived principally from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 150.

For geologic relations see U. S. Geol Survey Bull. 260, p. 382.

PITTSBURG COUNTY.

Buck. Buck No. 6 Mine.

Sample.—Bituminous (coking) coal; McAlester field; (Indian Territory No. 7) analyses Nos. 2645, 2646 (p. 150).

Mine.—Buck No. 6; a shaft mine in the McAlester district at Buck.

Coal bed.—Lower Hartshorne of the United States Geological Survey. Carboniferous (Allegheny) age, in the McAlester shale. Thickness, fairly uniform, averaging 4 feet 4 inches at this mine; roof, bluish sandy shale, in places soft; floor, hard shale; cover, for the most part over 500 feet thick.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. Von Borries on December 7, 1905, as described below:

Sections of coal bed in Buck No. 6 mine at Buck.

Section	A	B
Laboratory Nos	2645 *Ft. in.*	2646 *Ft. in.*
Roof, shale.		
Coal, soft	1 0	.. ..
Coal	3 5	4 0
Floor, shale.		
Thickness of coal bed	4 5	4 0
Thickness of coal sampled	4 5	4 0

Section A (sample 2645) was measured in room No. 16, off main north level, 600 feet north of the shaft.

Section B (sample 2646) was measured in room 2 from first south plane, 400 feet south of the shaft.

Notes.—The coal from this mine, like that from many others in this field, breaks rather easily into small pieces. In 1905 the slack coal (that passing through a 1-inch screen) was washed and made into coke at the mine. The average daily output of the mine was 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

Carbon. Central Mine.

Sample.—Bituminous coal; McAlester field; analysis No. 1735 (p. 150).

Mine.—Central; McAlester district, at Carbon, sec. 6, T. 5 N., R. 16 E.

Coal bed.—Lower Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by C. D. Smith.

The sample represented a 3-foot cut.

For chemical analyses of this coal see part I of this bulletin, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

CARBON. BORING NO. 9.

Sample.—Bituminous coal; McAlester field; analysis No. 6225 (p. 150).

Location.—Boring No. 9; McAlester district; 1,050 feet from center of tract No. 30, sec. 4, T. 6 N., R. 16 E., 2½ miles east of Carbon.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale. Thickness, 3 feet 2 inches.

The bed was sampled in 1908 by A. W. Thompson from diamond drill core 2 inches in diameter and from depth of 551⅔ feet. The sample represented 3 feet 2 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 150; also U. S. Geol. Survey Bull. 471.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

CHAMBERS. CHAMBERS MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1743 (p. 150).

Mine.—Chambers; McAlester district; at Chambers.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by C. D. Smith.

For chemical analyses of this coal see part I of this bulletin, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

COLEMAN. BOLEN DARNALL MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1757 (p. 150).

Mine.—Bolen Darnall; McAlester district; at Coleman, sec. 9, T. 4 N., R. 16 E.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by C. D. Smith.

The sample represented a 3¼-foot cut.

For chemical analyses of this coal see part I of this bulletin, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

CRAIG. BORING NO. 7.

Sample.—Bituminous coal; McAlester field; analysis No. 6224 (p. 151).

Location.—Boring No. 7; McAlester district; 3 miles east of Craig, in sec. 19, T. 4 N., R. 16 E.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale. It is 441 feet 6 inches below the surface at this point.

The sample was obtained by A. W. Thompson in 1908 by taking a 2-inch core of the entire bed, which is 4 feet thick. Depth of boring, 441½ feet.

For chemical analyses of this coal see part I of this bulletin, p. 151; also U. S. Geol. Survey Bull. 471.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

CRAIG. BORING NO. 6.

Sample.—Bituminous coal; McAlester field; analysis No. 6118 (p. 151).

Location.—Boring No. 6; McAlester district; 1,150 feet north, 60° E. of SW. cor. sec. 11, tract 53, T. 3 N., R. 14 E., 3 miles south of Craig.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled on March 30, 1908, by A. W. Thompson.

The sample represented a 3-foot 11-inch cut of coal. It was taken by the use of a diamond drill. The depth of boring to the top of the coal bed was 410 feet 3 inches. (Dip, 45°.)

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

DOW. MILBY & DOW MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1715 (p. 151).

Mine.—Milby & Dow; McAlester district; at Dow, sec. 26, T. 5 N., R. 16 E.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by C. D. Smith.

The sample represented a 35-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

EDWARDS. NO. 1 MINE.

Sample.—Bituminous coal; McAlester field; (Indian Territory No. 3) analyses Nos. 1079, 1080 (p. 151).

Mine.—No. 1; McAlester district; a slope mine at Edwards, on the Choctaw, Oklahoma & Gulf (Rock Island) Railroad.

Coal bed.—McAlester. Carboniferous (Allegheny) age, in the McAlester shale. Dip about 25°. The coal consists of one solid bench, free from binders or partings. It is overlain with about 3 inches of bony coal, which appears to be a characteristic feature in this mine.

The bed was measured and sampled at two points by J. W. Groves on September 8, 1904, as shown below:

Section of coal bed in No. 1 mine, at Edwards.

Section	A		B	
Laboratory No.	1080		1079	
	Ft.	*in.*	*Ft.*	*in.*
Bony coal [a]	0	3	0	3
Coal	3	10½	4	0
Thickness of bed	4	1½	4	3
Thickness of coal sampled	3	10½	4	0

[a] Not included in sample.

Section A was measured in west air course 2, and section B was measured in east air course 2.

Note.—The output in 1904 was used almost exclusively for steam making.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 513; Bull. 261, p. 81; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1439; Bull. 261, p. 155; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1468; Bull. 261, p. 68; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1338; Bull. 261, p. 124.

For chemical analyses see part I of this bulletin, p. 151; also U. S. Geol. Survey Prof. Paper 48, p. 217; Bull. 261, p. 40.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

HARTSHORNE. NO. 8 MINE.

Sample.—Bituminous (coking) coal: McAlester field; (Indian Territory No. 2) analyses Nos. 1071, 1073, and analysis No. 10053 (p. 151).

Mine.—No. 8; a shaft mine, 1 mile from Hartshorne on the Choctaw, Oklahoma & Gulf Railroad.

Coal bed.—Lower Hartshorne. Carboniferous (Allegheny) age, in the McAlester shale. Its thickness is uniform. The coal, which is very clean, has a shale (?) roof, and a floor of soft shaly clay. The cover is over 250 feet thick.

The bed was measured and sampled at two points by John W. Groves, in September, 1904. Sample 1073 included 4 feet 5½ inches of clean coal. It was measured in room 14 off the main east entry.

Sample 1071 included 3 feet 10 inches of clean coal. It was measured in room 16 off west entry 7.

The bed was subsequently measured and sampled at another point by L. M. Jones on February 17, 1910. The sample (10053) was taken in east air course, 4,100 feet west of shaft. It included a 48½-inch cut.

Notes.—In 1904 all but 9 per cent of the coal was used for locomotives on the Rock Island System. The remainder was used for steam and for household purposes, except about 3 per cent consumed locally or made into coke. The output of the mine was about 600 tons per day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 505; Bull. 261, p. 81; Bull. 332, p. 147; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1439; Bull. 261, p. 155; Bull. 332, p. 148; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1467; Bull. 261, p. 67; Bull. 332, p. 148; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1337; Bull. 261, p. 124.

For chemical analyses see part I of this bulletin, p. 151; also U. S. Geol. Survey Prof. Paper 48, p. 215; Bull. 261, p. 39; Bull. 332, p. 147.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

McAlester. Valley Mine.

Sample.—Bituminous coal; McAlester field; analysis No. 1737 (p. 151).

Mine.—Valley No. 2 slope; McAlester district; at McAlester.

Coal bed.—Lower Hartshorne Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

McAlester. McAlester No. 3 Mine.

Sample.—Bituminous coal; McAlester field; analysis No. 1736 (p. 151).

Mine.—McAlester No. 3; McAlester district; at McAlester.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by M. K. Shaler.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

Pittsburg. McAlester-Edwards No. 1 Mine.

Sample.—Bituminous coal; McAlester field; analysis No. 10060 (p. 151).

Mine.—McAlester-Edwards No. 1; McAlester district; a slope mine at Pittsburg, on the Chicago, Rock Island & Pacific, and the Missouri, Kansas & Texas Railways.

Coal bed.—Known in this field as the McAlester. Carboniferous (Allegheny) age, in the McAlester shale. The coal at this mine has an average thickness of 4 feet 3 inches, a hard shale roof with smooth surface, and a hard clay floor with rough surface. Bed dips 22½° to 26° NW.

The bed was measured and sampled by L. M. Jones on March 4, 1910, as described below:

Section of coal bed in McAlester-Edwards No. 1 mine, at Pittsburg.

Laboratory No.	10060	
Roof, hard shale, smooth.	*Ft.*	*in.*
Bony coal[a]	0	4
Bright hard coal	3	7
Floor, hard clay, rough.		
Thickness of bed	3	11
Thickness of coal sampled	3	7

[a] Not included in sample.

Section A (sample 10060) was cut from the face of left entry 5, off the east entry, 1,300 feet north and 14° east of the slope mouth.

Notes.—In 1910 the coal at this mine was not undercut but was shot off the solid with black powder. One side of the double tipple was equipped with bar screens with 1-inch openings, and the other side with shaking screens with $\frac{3}{4}$, 1, and 2 inch openings. About 10 per cent of the coal was shipped as run of mine, 25 per cent as slack, and 14 per cent as nut coal. The coal was picked on the car by three trimmers. Screenings of nut size and under were washed. The average daily tonnage was 190 tons, and a maximum day's run was 280 tons. There were 1,900 acres of coal under lease still unmined. The future output was to be derived almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

SAVANNA. NO. 1 MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1745 (p. 151).

Mine.—No. 1; McAlester district; at Savanna.

Coal bed.—McAlester. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in 1905 by C. D. Smith.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

SAVANNA. SAVANNA NO. 1 SLOPE.

Sample.—Bituminous coal; McAlester field; analysis No. 1744 (p. 151).

Mine.—Savanna No. 1 slope; McAlester district; at Savanna.

The bed was measured and sampled in 1905 by C. D. Smith.

For chemical analyses of this coal see part I of this bulletin, p. 151.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

SAVANNA. BORE HOLE NO. 2.

Sample.—Bituminous coal; Oklahoma field; analysis No. 5921 (p. 152).

Location.—Bore hole No. 2; McAlester district; in tract 69, NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 16, T. 4 N., R. 14 E., 1 mile southeast of Savanna.

Coal bed.—Lower Hartshorne. Carboniferous (Allegheny) age, McAlester shale.

The bed was measured and sampled in January, 1908, by A. W. Thompson. The sample represented a 3 foot 10 inch cut of coal. The sample was taken from a 2-inch core.

For chemical analyses of this coal see part I of this bulletin, p. 152; also U. S. Geol. Survey Bull. 471.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

SOUTH McALESTER. GREAT WESTERN MINE.

Sample.—Bituminous coal; McAlester field; analysis No. 1738 (p. 152).

Mine.—Great Western; McAlester district, at McAlester.

Coal bed.—The bed was measured and sampled in 1905 by C. D. Smith.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 382.

OREGON.

COOS COUNTY.

Beaver Hill. Beaver Hill Mine.

Sample.—Subbituminous coal; Coos Bay field; analyses Nos. 9151, 9152 (p. 152).

Mine.—Beaver Hill; a drift mine, in sec. 17, T. 27 S., R. 13 W., 1 mile southwest of Beaver Hill, 9 miles southwest of Marshfield, on the Coos Bay, Roseburg & Eastern Railroad.

Coal bed.—Newport, often designated locally the Beaver Hill. Tertiary (Eocene) age, Arago formation. Thickness, fairly uniform; strike, N. 45° E.; dip, SE. 31°; roof, varies from sandy shale or shaly sandstone to firm sandstone; floor varies from hard bituminous clay shale to sandstone. The floor is generally softer than the roof and "heaves."

The bed was measured and sampled in this mine at two points by M. A. Pishel on September 30, 1909, as shown below:

Sections of coal bed in Beaver Hill mine, 1 mile southwest of Beaver Hill.

Section	A		B	
Laboratory No.	9151		9152	
Roof, sandstone or sandy shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7	1	7
Dirt	[a] 0	3	[a] 0	4
Coal	0	2	0	1½
Dirt	[a] 0	1	[a] 0	1
Coal	2	6	2	4
Dirt (mining)	[a] 0	6	[a] 0	6
Coal	2	2	2	0
Floor, sandstone.				
Thickness of bed	6	3	6	11½
Thickness of coal sampled	5	5	6	½

[a] Not included in sample.

Section A (sample 9151) was collected in room 5, off entry 2, about 700 feet northwest of the mouth of the mine.

Section B (sample 9152) was collected about 1,000 feet southeast of the main entrance in room 8, off entry 8.

Notes.—The coal from this mine, like that from all others in this field, slakes when exposed to the atmosphere any length of time and is used almost exclusively for heating and power purposes. It is not considered a coking coal. This is the largest mine in this field, its maximum rated capacity at the time of sampling being about 200 tons a day. The coal is hand picked and washed to separate the impurities. The larger part of the product is used on the engines of the Coos Bay, Roseburg & Eastern Railroad, and on steamships which run out of Coos Bay.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

Coquille. Peart Brothers' Mine.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9188 (p. 152).

Mine.—Peart Brothers'; a small drift mine, in sec. 36, T. 27 S., R. 13 W., 1 mile north of Coquille, and within 1 mile of the Coos Bay, Roseburg & Eastern Railroad and the Coquille River.

Coal bed.—Newport, locally also known as the Beaver Hill. Tertiary (Eocene) age, Arago formation. The bed is here somewhat thicker and contains more bone coal than at Beaver Hill. It dips NW. 16° to 18°. The roof is sandstone with 6 inches of sandy shale over the coal; the floor is bony coal. The 7 inches of gray sandy clay between the coal and the floor is mined out. The mine goes into a hill 300 feet high.

The bed was measured and sampled by J. S. Diller and M. A. Pishel on October 11, 1909, as described below:

Section of coal bed in Peart Brothers' mine, 1 mile north of Coquille.

Laboratory No.	9188	
	Ft.	in.
Roof, sandstone.		
Sandy shale [a]	0	6
Jointed coal [a]	0	4
Sandy clay [a]	0	6
Good coal	0	3½
Sandy gray clay [a]	0	1
Good coal	3	4
Very sandy clay [a]	0	8
Bony coal [a]	1	0
Coaly bone [a]	1	11
Thickness of bed	8	7½
Thickness of coal sampled	3	7½

[a] Not included in sample.

Sample 9188 was collected from the face of a side entry, 140 feet west from the main slope and 480 feet down. The dirt was excluded as much as possible since the miners were careful to keep it out in loading coal.

Notes.—The coal from this mine, like that of all others in this field, air-slakes when exposed to the atmosphere for any length of time. It is not considered a coking coal. The mine was being opened up, having run about one year up to October, 1909, when the output was 10 to 30 tons a day. The output was sold mostly for domestic purposes.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

LAMPA. HAPPY HOOLIGAN PROSPECT.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9322 (p. 152).

Mine.—Happy Hooligan; a small drift opening in sec. 36, T. 28 S., R. 14 W., ½ mile west of Lampa on the Coquille River.

Coal bed.—Hooligan. Tertiary (Eocene) age, Arago formation; not correlated with any other bed elsewhere in the field. Sandstone roof, sandstone floor, but 6 inches of black clay between coal and floor; strike N. 9° W.; dip E. 30°.

The bed was measured and sampled by Max A. Pishel on November 3, 1909, as described below:

Section of coal in Happy Hooligan mine, ½ mile west of Lampa.

Laboratory No.	9322	
	Ft.	in.
Roof, sandstone.		
Bone [a]	1	0
Coal	0	3
Dirt	0	½
Coal	0	5
Dirt	0	½
Coal	1	6
Dirt	0	½
Coal	1	8
Black clay [a]	0	6
Floor, sandstone.		
Thickness of bed	5	5½
Thickness of coal sampled	3	11½

[a] Not included in sample.

Sample 9322 was a somewhat weathered sample collected from the wall of the entry, about 50 feet in from the mouth of the prospect.

Notes.—The coal from this mine air-slacks somewhat. The prospect was not worked and little coal had been sold from it. The coal is not considered a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

LAMPA. ALBEE MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9245 (p. 152).

Mine.—Albee; a drift mine in sec. 4, T. 29 S., R. 13 W., on branch of Fishtrap Creek, 4 miles from Fishtrap Landing, on the Coquille River, 3 miles southeast of Lampa and 5 miles west and 2 miles north of Myrtle Point on the Coos Bay & Eastern Railroad.

Coal bed.—Locally known as the Albee. Tertiary (Eocene) age, Arago formation. Thickness, uniform; dip, 22° SE.; roof, sandstone; floor, shale; cover, 50 to 300 feet.

The bed was measured and sampled by J. S. Diller on October 5, 1909, as described below:

Section of coal bed in Albee mine, 3 miles southeast of Lampa.

Laboratory No.	9245	
	Ft.	*in.*
Roof, massive sandstone.		
Coal, hard	1	0
Parting [a]	0	4
Coal, block, hard	2	0
Coal, bony [a]	1	0
Floor, shale.		
Thickness of bed	4	4
Thickness of coal sampled	3	0

[a] Not included in sample.

The sample was collected after removing an inch of surface coal from a weathered face of a shallow opening.

Note.—In 1909 only a few tons of coal for domestic purposes had been removed from the prospect.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

LIBBY. LIBBY MINE.

Sample.—Subbituminous coal; Coos Bay field; analyses Nos. 2461, 2462 (p. 152).

Mine.—Libby; in sec. 4, T. 26 S., R. 13 W., near Libby, 3 miles southwest of Marshfield, on a small branch railway to Deepwater on Coos Bay.

Coal bed.—No name. Tertiary (Eocene) age, Arago formation.

The bed was measured and sampled on October 23, 1905, by M. R. Campbell, as shown below:

Sections of coal bed in Libby mine, near Libby.

Laboratory No.	2461		2462	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	6	0	7
Shale [a]	0	9	0	10
Coal	2	8	2	5
Shale [a]	0	8	0	8
Coal	2	9	2	4
Thickness of bed	7	4	6	10
Thickness of coal sampled	5	11	5	4

[a] Not included in sample.

Sample 2461 was obtained in the third gangway west from bottom of basin, above sea level and 1,000 feet from entrance to mine.

Sample 2462 was obtained below sea level in the first gangway west, 900 feet from bottom of slope.

For chemical analyses of this coal see part I of this bulletin, p. 152.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

MARSHFIELD. SOUTH MARSHFIELD MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9124 (p. 153).

Mine.—South Marshfield; a drift mine in sec. 34, T. 25 S., R. 13 W., 1 mile southwest of Marshfield, a seaport on Coos Bay.

Coal bed.—Newport, designated locally as the Libby, the Southport, or the Beaver Hill. Tertiary (Eocene) age, Arago formation. Thickness, fairly uniform; dip, 14° W. The main roof is sandstone but is generally underlain with thin firm shale and coal which are used as a roof. The floor is firm shaly sandstone; the cover is 50 to 300 feet.

The bed was measured and sampled by J. S. Diller on July 1, 1909, as shown below:

Section of coal bed in South Marshfield mine, 1 mile southwest of Marshfield.

Laboratory No.	9124	
Roof, thick massive sandstone.	*Ft.*	*in.*
Coal, hard, often shaly [a]	0	10
Shale, soft gray with shells [a]	0	8
Coal, hard [a]	0	2
Shale [a]	0	1
Coal	1	8
Bone [a]	0	1½
Coal	0	5
Shale [a]	1	0
Coal	2	0
Floor, shaly sandstone.		
Thickness of bed	6	11½
Thickness of coal sampled	4	1

[a] Not included in sample.

The sample was collected from a fresh face at the end of the main entry, 500 feet from the entrance to the mine. The sample was limited, as indicated in the section, to the part of the bed that is actually removed in mining. The 1½ inches of bone and the foot of shale are easily separable from the coal in mining.

Notes.—The coal at this mine is well blocked by joints, and in the ordinary mining operations does not yield a large proportion of waste. In 1909 the slack and the nut coal, approximately half the weight of the lump coal, were hauled in wagons to Marshfield and sold for local use. The rated capacity of the mine as worked ordinarily was about 20 tons per day. Little more than an acre of coal had been removed.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

MARSHFIELD. WATERWORKS MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9123 (p. 153).

Mine.—Water-works plant; sec. 27, T. 25 S., R. 13 W., 1 mile west of Marshfield, a seaport on Coos Bay.

Coal bed.—Waterworks, also called Reservoir. Tertiary (Eocene) age, Arago formation. Thickness, fairly uniform; dip, 13° NE. The roof is firm shale, 4 feet thick, overlain with sandstone; must be timbered nearly everywhere. Floor, sandstone. Cover, 50 to 200 feet.

The bed was measured at two points, one at the Old Reservoir mine and one at the Waterworks mine. A sample was taken at the latter point by J. S. Diller on July 5, 1909, as noted below:

Sections of coal bed in Waterworks mine and in Old Reservoir mine.

Laboratory No.	9123		(a)	
Main roof, firm shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7	0	6
Fine sand [b]	0	2	0	2
Coal [b]	0	2	0	2
Fine sand [b]	0	2	0	2
Coal	2	0	2	0
Fine sand [b]	0	3	0	5
Coal, hard, conchoidal fracture	0	6	0	6
Floor, sandstone.				
Thickness of bed	3	10	3	11
Thickness of coal sampled	3	1	..	..

[a] No sample taken.

[b] Not included in sample.

The sample was collected from the face of the main entry, 700 feet from the entrance, and had been exposed only a few days.

Notes.—The coal from the Waterworks mine is, for the most part, friable and dull, but there has been little waste. The coal has been in constant use for a number of years under the two boilers of the waterworks plant of Marshfield, at the rate of about 1,500 tons annually. It has been used for no other purpose, and is noncoking.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

MARSHFIELD. LILLIAN MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9127 (p. 153).

Mine.—Lillian mine; a small drift mine in sec. 4, T. 26 S., R. 12 W., 4 miles southeast of Marshfield, and within 1½ miles of Coos River.

Coal bed.—Known as the "Lillian vein." Tertiary (Eocene) age, Arago formation. The strike is N. 46° W., and the dip 16° to 18° SW. The thickness of this bed is variable, being thicker at this mine than at any other place. The upper portion of the bed has the appearance of having been subjected to pressure. The lower portion of the bed has rhomboidal cleavage, but is rather firm. The roof is heavy-bedded sandstone. The floor is soft shaly clay.

The bed was measured and sampled on August 5, 1909, by J. S. Diller and M. A. Pishel, as described below:

Section of coal in Lillian mine, 4 miles southeast of Marshfield.

Laboratory No.	9127	
Roof, sandstone.	*Ft.*	*in.*
Coal and coaly shale, mixed[a]	1	6
Squeezed clay[a]	0	6
Coal, good	0	10
Clay[a]	0	3
Bright and shiny coal	2	10
Sandstone[a]	0	1
Coal, good	1	0
Irregular parting[a]	0	4
Coal	0	8
Sandy parting[a]	0	2
Coal, good	1	2
Floor, soft, shaly clay.		
Thickness of bed	9	4
Thickness of coal sampled	6	6

[a] Not included in sample.

The sample was taken in the mine, 620 feet from the entrance.

Notes.—The coal from this mine, like that of all mines in this field, air-slacks by exposure to the atmosphere any length of time It is not considered a coking coal, but appeared good enough for heating and even for steam purposes. The mine was not in operation at time of sampling, had never produced very much, and was in the prospect stage.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

MAXWELL. SMITH AND POWER MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9187 (p. 153).

Mine.—Smith and Power; in sec. 36, T. 26 S., R. 13 W., 2 miles southeast of Maxwell, on the Coos Bay, Roseburg & Eastern Railroad.

Coal bed.—The bed can not definitely be correlated with any other bed in the field. It belongs to the Beaver Hill group and is of Tertiary (Eocene) age, Arago formation. The strike is N. 45° E., dip W. 40°. The roof is shale, is very poor and requires much timbering. The bony coal at the bottom makes a good floor in mining. A fire-clay shale underlies the whole bed.

The bed was measured and sampled by M. A. Pishel on August 19, 1909, as described below:

Section of coal bed in Smith and Power mine, 2 miles southeast of Maxwell.

Laboratory No	9187	
Roof, shale.	*Ft.*	*in.*
Coal	1	3
Dirt[a]	0	2
Coal	0	3
Dirt[a]	0	2
Coal (best)	1	5
Clay[a]	0	3
Bone[a]	0	3
Clay[a]	0	2½
Coaly bone[a]	0	3–7
Floor, shale.		
Thickness of bed	4	6½
Thickness of coal sampled	3	1

[a] Not included in sample.

The sample was taken in third room, 150 feet northeast of mouth of mine. The 1-foot 3-inch bed and the 1-foot 5-inch bed only are used. The seams in between are used as "mining seams."

Notes.—The coal from this mine, like that from all others in this field, air-slacks when exposed any length of time to the atmosphere. It is not considered a coking coal and is used almost exclusively for heating and power purposes. In 1909 the mine was small and intended to furnish only enough coal for a logging camp and logging engines. In September of that year the output was only about 4 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

NORTH BEND. WILCOX MINE.

Sample.—Subbituminous coal; Coos Bay field; analyses Nos. 9125, 9126 (p. 153).

Mine.—Wilcox; at Yarrow Landing, North Bend, in sec. 15, T. 25 S., R. 13 W., 3 miles north of Marshfield.

Coal beds.—North Bend No. 1 (also designated as Lower bed) and North Bend No. 2. Tertiary (Eocene) age. Thickness, uniform; dip, 35° NW. Roof, 12 feet of massive sandstone underlain with 4 inches of bony coal. One inch of shale or sand separates the coal from the massive sandstone floor. Cover, 150 feet.

The North Bend No. 1 bed was measured and sampled by J. S. Diller on July 7, 1909, as noted below:

Section of coal bed in Wilcox mine at North Bend.

Laboratory No	9125	
Roof, massive sandstone.	*Ft.*	*in.*
Coal, bony[a]	0	4
Coal (streak of shale near middle)	1	4
Shale[a]	0	1
Floor, sandstone.		
Thickness of bed	1	9
Thickness of coal sampled	1	4

[a] Not included in sample.

The sample was collected at end face of the main entry, 180 feet from the entrance of the mine.

The North Bend No. 2 bed was also measured and sampled. The sample (No. 9126) represented an 18-inch cut of coal. It was collected in the main entry near a crosscut 40 feet long from the lower coal and about 200 feet from the mine entrance on the lower coal. The entry is in shale. The sample represented the whole thickness of the bed but none of the overlying carbonaceous shale.

Notes.—The coal represented by sample 9125 lies 22 feet below that represented by sample No. 9126, which is worked by crosscut in the same mine. The coal, like that of the upper bed, is rather firm, with rhombohedral cleavage. In 1909 the small amount of screenings produced was sold. Although it was used mostly for domestic purposes, some of the coal was used to make steam. It is noncoking. The mine had been running only a few months. The entry was in about 400 feet, and several hundred tons had been delivered directly from mine to consumer.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

NORTH BEND. GILBERTON MINE.

Sample.—Subbituminous coal; Coos Bay coal field; analysis No. 9128 (p. 153).

Mine.—Gilberton; on the north side of Kentuck Slough, in the NW. ¼ NW. ¼ sec. 6, T. 25 S., R. 12 W., 8 miles northeast of Marshfield and 3 miles northeast of North Bend.

Coal bed.—Called the Steva coal. Tertiary (Eocene) age, Arago formation. Thickness, rather variable; dip, SW. 15° to 23°. Roof, firm sandstone; floor, fine hard shaly sandstone. Cover increases to southwest from 50 to over 2,000 feet under Coos Bay.

The bed was measured and sampled on August 11, 1909, by J. S. Diller, as shown below:

Section of coal bed in G. Gilberton mine, 3 miles northeast of North Bend.

Laboratory No.	9128	
Roof, sandstone.	*Ft.*	*in.*
Coal, platy, with rusty joints	1	4
Shale [a]	0	7
Coal	1	1
Sandy layer [a]	0	3
Coal, finely jointed in pencils	1	6
Sandy clay [a]	0	6
Coal, partly hard and conchoidal, but mostly shaly	2	9
Sandy clay [a]	0	4
Coal (best), hard, conchoidal	1	8
Floor, sandstone.		
Thickness of bed	10	0
Thickness of coal sampled	8	4

[a] Not included in sample.

The sample was collected on a steep slope faced up six months previously, but in a shady damp place; it was not deeply weathered. Two inches of surface coal were removed before taking the sample, which was bright and fresh looking.

Notes.—In 1909 this mine had not reached the working stage. The bed is conveniently located for mining. In 1909 less than 50 tons had been removed by scow and sold at North Bend.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

RIVERTON. EUREKA MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9312 (p. 153).

Mine.—Eureka; a small drift mine, located near Riverton, on the Coquille River.

Coal bed.—Eureka or Adams. Tertiary (Eocene) age, Arago formation. Thickness, fairly uniform in this part of the field; roof, thick-bedded sandstone, in places underlain with 4 inches of bone that does not give trouble in mining. The bottom is composed of about 14 feet of bony layers and is very firm.

The bed was measured and sampled by M. A. Pishel on October 30, 1909, as described on the following page:

Section of coal in Eureka mine, near Riverton.

Laboratory No	9312
Roof, sandstone.	*Ft. in.*
Bone [a]	0 2
Dirt [a]	0 1
Bone [a]	0 2
Coal, good	2 0
Coal, with some bone	2 0
Floor, bone.	
Thickness of bed	4 5
Thickness of coal sampled	4 0

[a] Not included in sample.

Sample 9312 was collected in the air course from a fresh surface about 250 feet east of the mouth of the mine.

Notes.—The coal from this mine, like that from all others in this field, air-slakes when exposed to the atmosphere any length of time. It is considered noncoking and was used in 1909 almost exclusively for heating and power purposes. The mine was then new, and very little coal had been sold from it. The company expected to ship the output by boat to the smaller towns along the river and the coast.

For chemical analyses of this coal, see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

RIVERTON. GAGE MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9313 (p. 153).

Mine.—Gage; a drift mine at Riverton, on the Coquille River.

Coal bed.—Timon, of J. S. Diller's report (1897), locally known as the "Bandon Seam." Tertiary (Eocene) age, Arago formation. Thickness, fairly uniform in this part of the field. Strike variable from N. to N. 45° W.; dip, 8° to 22° E. The roof is sandstone, which holds up rather well. The bituminous shale at the bottom serves as a floor in mining. It is fairly hard and does not give much trouble.

The bed was sampled and measured by M. A. Pishel on October 30, 1909, as shown below:

Section of coal bed in George Gage mine, at Riverton.

Laboratory No	9313
Roof, sandstone.	*Ft. in.*
Coal	0 3
Dirt [a]	0 1
Coal	0 8
Bone [a]	0 3
Dirty bone [a]	0 3
Coal	0 4½
Dirt [a]	0 1½
Coal	1 3½
Bituminous shale [a]	0 10
Thickness of bed	4 1½
Thickness of coal sampled	2 7

[a] Not included in sample.

Sample 9313 was taken in room 1 of south entry 1, about 450 feet from the mouth of the mine. The coal is hard and shiny. The principal cleat runs north and south, with minor cleats nearly at right angles.

Notes.—The coal from this mine, like that from all others in this field, air-slakes when exposed to the atmosphere any length of time. It is not considered a coking coal and is used almost exclusively for heating and steam purposes. The mine had just been opened, and very little coal had been sold at the time the sample was taken. The owner expected to increase the force as the mine was enlarged and expected to have an output of 150 tons daily during the ensuing winter. Shipments to Portland or San Francisco were contemplated.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

RIVERTON. OLD ROUSE MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9311 (p. 153).

Mine.—Old Rouse; a drift mine at Riverton, on the Coquille River, in sec. 9, T. 28 S., R. 13 W.

Coal bed.—Bunker, of Diller's report, locally called the "Rouse Seam." Tertiary (Eocene) age, Arago formation. Thickness, 2 feet 3 inches. It can not definitely be correlated with any other bed in this field. Roof, shale, fairly firm; bottom, sandy shale, which heaves somewhat. Strike, N. 3° W.; dip, 19° E.

The bed was measured and sampled by M. A. Pishel on October 29, 1909, as shown below:

Section of coal bed in the Old Rouse mine, at Riverton.

Laboratory No	9311	
Roof, shale.	*Ft.*	*in.*
Coal	2	3
Bone[a]	0	1
Floor, sandy shale.		
Thickness of bed	2	4
Thickness of coal sampled	2	3

[a] Not included in sample

The sample was taken at a point 100 feet from the mouth of the mine in room 1 of entry 1.

The coal sold better than any other coal mined in this field, since it is comparatively free from ash and suffers little deterioration from storage. It is clearly a subbituminous coal. The cleavage is not very markedly developed here.

Notes.—The coal from this mine, like that from all others in this field, air-slakes when exposed to the atmosphere any length of time. It is not considered a coking coal and is used almost exclusively for heating and power purposes. In 1909 the capacity of the mine was small. At the time the sample was taken only two men were working, each producing about 2 tons per day.

For chemical analyses of this coal see part 1 of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

SUMNER. NEWCASTLE MINE.

Sample.—Subbituminous coal; Coos Bay field; analysis No. 9189 (p. 153).

Mine.—Newcastle; a small drift mine, in sec. 20, T. 26 S., R. 12 W., 2 miles north of Sumner and 5 miles southeast of Marshfield, on the Catching Inlet.

Coal bed.—Newcastle. Tertiary (Eocene) age, Arago formation; could not be correlated with any other bed in the field. Strike N. 30° W.; dip, 9° SW. Roof, firm sandy shale; the 8-inch seam of dirt between the two beds of coal is used as a mining seam; floor, sandy clay, hard with rather smooth surface.

The bed was measured and sampled by M. A. Pishel on September 7, 1909, as described below:

Section of coal at Newcastle mine, 2 miles north of Sumner.

Laboratory No	9189	
Roof, firm sandy shale.	*Ft.*	*in.*
Coal	2	2
Mining seam clay[a]	0	8
Coal	0	9
Floor, hard sandy clay.		
Thickness of bed	3	7
Thickness of coal sampled	2	11

[a] Not included in sample.

Sample 9189 was taken at a rather wet place at the face of mine entry, 150 feet southeast of the mouth of the mine and under 150 feet of cover. All dirt was excluded as much as possible.

Notes.—The coal from this mine, like that from all others in the field, air-slacks when exposed to the atmosphere any length of time. It was used exclusively for heating and power purposes and is not considered a coking coal. The mine was small. During the winter of 1909–10 a production of 40 tons daily was contemplated; the coal was to be sold for local use.

For chemical analyses of this coal see part I of this bulletin, p. 153.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 192.

PENNSYLVANIA.

ALLEGHENY COUNTY.

Bruceton. Bertha Mine.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 10) analyses Nos. 2080, 2081, p. 153.

Mine.—Bertha; a drift mine, in the Pittsburgh district, at Bruceton, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness, fairly uniform, at this mine averaging about 5½ feet. Dip, slight, southwest. Roof, soft gray shale; floor, fire clay.

The bed was measured and sampled at two points in the mine by W. J. von Borries and J. W. Groves, on August 30, 1905, as shown below:

Sections of coal bed in Bertha mine, at Bruceton.

Section	A		B	
Laboratory No	2080		2081	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	5
Mother coal	0	⅛	0	⅛
Coal	1	10	0	5½
Shale	[a]0	½	..	..
Shale and mother coal	..	..	0	¼
Coal	0	3	0	10
Shale	[a]0	1	[a]0	½
Coal	1	3	0	3
Mother coal	0	⅛	..	..
Shale	..	..	[a]0	1¼
Coal	0	8	0	10
Sulphur	[a]0	½	..	..
Shale	..	..	0	⅛
Coal	[a]0	2½	1	0
Shale	..	..	0	¼
Coal	..	..	0	2
Floor, fire clay.				
Thickness of bed	5	4¾	5	2
Thickness of coal sampled	5	¼	5	¼

[a] Not included in sample.

Section A (sample 2080) was measured in No. 1 face entry, off No. 1 butt entry, 5,000 feet from the drift mouth.

Section B (sample 2081) was measured in the face of face entry 3, 5,000 feet from the drift mouth.

Notes.—The coal from this mine was used largely for steam production, and was shipped to various manufacturing centers in Pennsylvania and adjacent States.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 184; Bureau of Mines Bull. 23, pp. 67, 177; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 185; Bureau of Mines Bull. 13, pp. 184, 275; coking tests: U. S. Geol. Survey Bull. 290, p. 186; Bull. 336, pp. 24, 32, 41; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 153; also U. S. Geol. Survey Bull. 290, p. 184.

CLINTON. COUNTRY BANK.

Sample.—Bituminous coal, Pittsburgh field; analysis No. 1048 (p. 153).

Location.—Country bank; Pittsburgh district, at Clinton.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness, at this mine, 5 feet, 2 inches.

Sample 1048 was taken by W. T. Griswold on July 14, 1904, as shown below:

Section of coal bed in country bank at Clinton.

Laboratory No.	1048	
	Ft.	*in.*
Coal	1	0
Parting [a]	0	½
Coal	4	2½
Thickness of coal bed	5	3
Thickness of coal sampled	5	2½

[a] Not included in sample.

For chemical analyses of this coal, see part I of this bulletin, p. 153; also U. S. Geol. Survey Prof. Paper 48, p. 112.

CREIGHTON. CREIGHTON MINE.

Sample.—Bituminous coal; Beaver field; (Pennsylvania No. 13) analyses Nos. 3437, 3438 (p. 154).

Mine.—Creighton; a drift mine in the Pittsburgh district, at Creighton, on the Pennsylvania Railroad.

Coal bed.—Upper Freeport, locally known as the "E" (?). Carboniferous age, Allegheny formation. Thickness, fairly uniform, averaging, at this mine, 5 feet 10 inches. The bed lies nearly flat. The roof is cannel coal, about 6 inches thick, above which is gray shale. The cannel coal makes a good roof. The floor is good, a hard gray shale. The bed carries an 8-inch band of bony coal that is thrown out in mining.

The bed was measured and sampled at two points in the mine by J. W. Groves and F. B. Tough on July 13, 1906, as shown below:

Sections of coal bed in Creighton mine, at Creighton.

Section	A		B	
Laboratory No.	3437		3438	
	Ft.	*in.*	*Ft.*	*in.*
Roof, cannel coal.				
Coal	1	4	2	2
Shale	0	½	..	..
Bony coal [a]	..	..	0	8
Coal	0	11	2	4
Bony coal [a]	0	9½	..	..
Mother coal	..	..	0	¾
Coal	3	0	0	5
Floor, shale.				
Thickness of bed	6	1	5	7¾
Thickness of coal sampled	5	3½	4	11¾

[a] Not included in sample.

Section A (sample 3437) was measured in butt entry 5, 4,800 feet northwest of the drift mouth.

Section B (sample 3438) was measured in the main entry, 5,500 feet northwest of the drift mouth.

Notes.—In 1906 the output of this mine was largely used for steam production and for glass manufacture by the company owning the mine. The approximate output of the mine in 1906 was about 1,200 tons per day.

For results of tests of this coal see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 200; Bureau of Mines Bull. 13, pp. 192, 275.

For chemical analyses see part I of this bulletin, p. 154; also U. S. Geol. Survey Bull. 332, p. 200.

SCOTT HAVEN. OCEAN NO. 2 MINE.

Sample.—Bituminous coal; Pittsburgh field; (Ann Arbor No. 1) analyses Nos. 6627, 6656 (p. 154).

Mine.—Ocean No. 2; Pittsburgh district; on south edge of town of Scott Haven.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Roof, shale, thickness, about 5 feet.

The bed was measured and sampled at two points in 1908 by G. S. Pope, as shown below:

Sections of coal bed in Ocean No. 2 mine, at Scott Haven.

Laboratory No.	6627		6656	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	$4\frac{1}{4}$	1	$6\frac{3}{8}$
Cannel	0	$\frac{3}{8}$	0	$\frac{3}{8}$
Coal	0	$11\frac{1}{2}$	0	8
Mother coal	0	$\frac{5}{16}$	Streak.	
Coal	0	$6\frac{5}{8}$	0	$10\frac{1}{2}$
Blue band and shale [a]	0	$\frac{5}{16}$	0	$\frac{1}{2}$
Coal [a]	0	$4\frac{1}{8}$	0	$4\frac{3}{4}$
Blue band and shale [a]	0	$\frac{5}{8}$	0	$\frac{5}{16}$
Coal	1	0	1	3
Unknown (machine cut)[a]	0	5	0	5
Thickness of bed	4	$9\frac{1}{8}$	5	$2\frac{13}{16}$
Thickness of coal sampled	3	$11\frac{1}{16}$	4	$4\frac{1}{4}$

[a] Not included in sample.

Sample 6627 was taken in room 19, off south entry 14, off face entry 1, and was dry when taken.

Sample 6656 was taken in room 19, off north entry 10, off face entry 6, and was dry when taken.

For results of illuminating-gas tests of this coal see Bureau of Mines Bull. 6, pp. 28, 47.

For chemical analyses see part I of this bulletin, p. 154.

BEAVER COUNTY.

FRANKFORT. COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1067 (p. 154).

Location.—Country bank; Pittsburgh district, north of Frankfort.

Coal bed.—Pittsburgh. The bed is of Carboniferous age, Monongahela formation.

The bed was sampled by W. T. Griswold in 1904. No record of the sampling was preserved.

For chemical analyses of this coal see part I of this bulletin, p. 154; also U. S. Geol. Survey Prof. Paper 48, p. 273.

CAMBRIA COUNTY.

Bakerton. Sterling No. 1 Mine.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8992, 8993, 8994, 8995, 9035 (pp. 154, 155).

Mine.—Sterling No. 1; Central Pennsylvania district; a drift mine located at Bakerton, on the Cambria & Clearfield Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, known in this field as the B. Carboniferous age, Allegheny formation. The part of the bed mined has an average thickness, 3 feet. The roof is good, a clay shale; the floor is under clay. The actual floor of the coal as mined is about 2 feet above the floor of the coal bed, layers of shale and coal intervening as follows: Shale, 4 inches; coal, 6 inches; shale, 4 inches; and coal, 10 inches.

The bed was measured and sampled at four points by H. M. Wolflin on September 3 and 4, 1909, as described below:

Sections of coal bed in Sterling No. 1 mine, at Bakerton.

Section	A		B		C		D	
Laboratory No	8992		8993		8995		8994	
Roof, shale and top coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (hard)	..	..	0	1	..	..	..	..
Coal	0	9	0	5¾	0	6	0	7½
Coal (hard)	..	..	0	¼	0	½	0	½
Coal (gray)	0	7	1	5½	..	..	1	0
Coal	..	..	..	..	1	7	1	6½
Pyrites[a]	0	¼	0	1½	0	1	..	..
Coal	1	9	1	1½	1	½	..	..
Floor, shale, coal, underclay.								
Thickness of bed	3	1¼	3	3½	3	3	3	2½
Thickness of coal sampled	3	1	3	2	3	2	3	2½

[a] Not included in sample.

Section A (sample 8992) was cut from the face of left entry 3, off main entry, 4,100 feet S. 45° E. from the drift mouth.

Section B (sample 8993) was cut from the face of the main entry, 5,600 feet S. 6° E. from the drift mouth.

Section C (sample 8995) was cut from pillar 2 off right entry 2, off main entry, 1,200 feet S. 10° W. from the drift mouth.

Section D (sample 8994) was cut from the face in room on left entry 3, off the dip entry, 3,200 feet S. 15° W. from the drift mouth.

A composite sample was made by mixing the face samples 8992, 8993, and 8994 for an ultimate analysis, the results of which are shown under laboratory No. 9035.

Notes.—The coal at this mine was undercut by hand and shot down with black powder. As the tipple was not provided with screens, the coal was all loaded as run of mine. The daily capacity of the mine in November. 1909, was reported as 1,000 tons, and the average output as 700 tons.

For chemical analyses of this coal see part I of this bulletin, (p. 155).

Bakerton. Sterling No. 5 Mine.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8990, 8991, and 9034 (p. 155).

Mine.—Sterling No. 5; a drift mine in the Central Pennsylvania district, at Bakerton, on the Cambria & Clearfield division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, known in this field as the B. Carboniferous age, Allegheny formation. The coal as mined has an average thickness of 3 feet. Roof, good, hard shale; floor, hard clay.

The bed was measured and sampled at two points by H. M. Wolflin on September 3, 1909, as described below:

Sections of coal bed in Sterling No. 5 mine, at Bakerton.

Section	A		B	
Laboratory No	8990		8991	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	4½	0	2
Coal (hard)	0	1	0	6
Bony coal	..	..	0	¼
Coal	0	6	..	..
Coal (gray)	0	⅛	0	11
Pyrites	0	⅛	..	..
Coal	1	4½	1	8¼
Floor, underclay.				
Thickness of bed	2	4¼	3	3½
Thickness of coal sampled	1	11¾	3	1½

[a] Not included in sample.

Section A (sample 8990) was cut from the face of block entry, off main entry, 1,400 feet N. 50° E. from the drift mouth.

Section B (sample 8991) was cut from the face of right entry 7, off main entry, 2,200 feet N. 30° E. from the drift mouth.

A composite sample was made by mixing the face samples 8990 and 8991. The results of an ultimate analysis are shown under laboratory No. 9034.

Notes.—In 1909 the coal at this mine was undercut by hand picks and shot down with black powder. The tipple had no screens and the coal was loaded in run-of-mine form. The estimated capacity of the mine in November, 1909, was 600 tons daily, and the estimated daily output was about 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 155.

BAKERTON. STERLING NO. 6 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8996, 8997, 8998, 9046, 9047, and 9052 (p. 155).

Mine.—Sterling No. 6; a drift mine in the Central Pennsylvania district; at Bakerton (Elmora post office), on the Cambria & Clearfield division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, known in this field as the B. Carboniferous age, Allegheny formation. The coal as mined has an average thickness of 3 feet; roof, hard gray shale; floor, hard underclay.

The bed was measured and sampled at five points by H. M. Wolflin on September 2, 1909, as described below:

Sections of coal bed in Sterling No. 6 mine, at Bakerton.

Section	A		B		C		D		E	
Laboratory No	8996		8997		8998		9046		9047	
Roof, shale and top coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	6	0	9½	..	..	..	..	..	..
Coal (hard)	..	..	..	..	..	..	..	..	0	3
Pyrites	[a] 0	½	..	..	..	..	..	..	..	..
Bony coal	..	..	..	..	..	..	0	1½	..	..
Coal (tough gray)	0	8¾	0	8	1	4½	0	8¼	0	7
Pyrites	0	¼	..	..	[a] 0	½	[a] 0	¼	..	..
Coal	1	8½	1	8	1	5½	1	11	2	½
Floor, hard underclay.										
Thickness of bed	3	0	3	1½	2	10½	2	9	2	10½
Thickness of coal sampled	2	11½	3	1½	2	10	2	8¾	2	10½

[a] Not included in sample.

Section A (sample 8996) was cut from the face of left entry 1, off main dip entry, 4,200 feet S. 30° W. from the drift mouth.

Section B (sample 8997) was cut from the face of left entry 4, off main dip entry, 3,800 feet S. 45° W. from the drift mouth.

Section C (sample 8998) was cut from the pillar between left entries 2 and 3, off dip entry near room No. 15, 3,200 feet S. 45° W. from the drift mouth.

Section D (sample 9046) was cut from the face of right entry 3, off left entry 2, 4,800 feet S. 45° E. from the drift mouth.

Section E (sample 9047) was cut from the face of right entry 7, off left entry 2, 5,300 feet S. 60° W. from the drift mouth.

A composite sample was made by mixing the face samples 8996, 8997, 9046, and 9047. The results of ultimate analysis of this sample are shown under laboratory No. 9052.

Notes.—In 1909 the coal at this mine was undercut with hand picks and shot down with black powder. The coal was loaded entirely as run-of-mine, there being no screens. The coal was picked by one trimmer as it was loaded on the cars. The estimated capacity of the mine in 1909 was 900 tons daily, and the actual average output was about 700 tons daily. The output was derived both from pillars and advance work.

For chemical analyses of this coal see part I of this bulletin, p. 155.

BARNESBORO. LANCASHIRE NO. 10 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7958, 7957 (p. 155).

Mine.—Lancashire No. 10; Central Pennsylvania district; Barnesboro.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 11, 1909, by Charles Butts, as described below:

Section of coal bed in Lancashire No. 10 mine at Barnesboro.

Laboratory Nos	7958		7957	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	11	2	7
Parting [a]	0	½	0	1½
Coal	0	9½	0	8½
Floor, clay, hard.				
Thickness of bed	3	9	3	5
Thickness of coal sampled	3	8½	3	3½

[a] Not included in sample.

Sample 7958 was taken from right heading 4.

Sample 7957 was taken from right heading 5.

Note.—The output in 1910 was 46,473 tons.

For chemical analyses of this coal see part I of this bulletin, p. 155.

BARNESBORO. LANCASHIRE NO. 12 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7963, 7953 (p. 155).

Mine.—Lancashire No. 12, in the Central Pennsylvania district; Barnesboro.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 11, 1909, by Charles Butts, as described below:

Section of coal bed in Lancashire No. 12 mine at Barnesboro.

Laboratory No.	7963		7953	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	10	3	8
Parting (2 feet long, very local not noted elsewhere in mine) [a]	0	1¼	0	1
Coal	2	7	0	9
Parting [a]	0	1½	..	..
Coal	0	9½	..	..
Floor, clay.				
Thickness of bed	4	5¼	4	6
Thickness of coal sampled	4	2½	4	5

[a] Not included in sample.

Sample 7963 was taken at right heading 13.

Sample 7953 was taken at left heading 11.

Note.—The output in 1910 was 276,584 tons.

For chemical analyses of this coal see part I of this bulletin, p. 155.

BARNESBORO. DELTA MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10285, 10286, 10287, 10262, 10263, 10292 (pp. 155, 156).

Mine.—Delta; a drift mine in the Central Pennsylvania district; ¾ mile northeast of Barnesboro, and on the Cresson division of the Pennsylvania Railroad.

Coal bed.—Lower Freeport, known in this field as the D. Carboniferous age, Allegheny formation. At this mine the bed as mined has an average thickness of 4 feet, and varies from 3 feet 10 inches to 4 feet 8 inches. The roof is a dark shale of excellent quality, having a thickness of 8 feet and being overlain with sandstone. The floor is a medium hard underclay with a smooth surface.

The bed was measured and sampled at five points by R. Y. Williams on April 15, 1910, as described below:

Sections of coal bed in Delta mine, ¾ mile northeast of Barnesboro.

Section	A		B		C		D		E	
Laboratory No.	10285		10286		10262		10287		10263	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone and dark shale.										
Bone	[a] 0	2	[a] 0	2	[a] 0	2	[a] 0	2¼	[a] 0	1½
Coal, soft bright	0	2	..	..	1	4¾	2	3	1	5
Sulphur and charcoal	0	1	..	..	[a] 0	½	..	..	..	..
Coal, soft bright	0	6	1	4	..	7¾	..	..	..	..
Charcoal	0	½	0	¼	..	¼	0	¼	0	⅛
Coal, soft bright	0	10½	0	10	..	..	..	..	0	10½
Sulphur and charcoal	[a] 0	½	..	..	..	..	..	..	0	¼
Coal, soft bright	[a] 0	7½	..	..	..	..	..	..	..	..
Coal, hard gray	0	2	0	1½	..	..	..	..	..	..
Coal, soft bright	0	11⅝	0	11	0	11	1	1	0	10
Slate binder	[a] 0	1	[a] 0	½	[a] 0	½	[a] 0	1¼	[a] 0	1¼
Coal, soft bright	1	⅞	0	11½	1	½	1	½	1	1¼
Floor, medium hard underclay.										
Thickness of bed	4	9½	4	4¾	4	3¼	4	8¼	3	5⅞
Thickness as sampled	3	10½	4	2¼	4	¼	4	4¾	3	3⅛

[a] Not included in sample.

Section A (sample 10285) was cut from the face of left entry 16, off the main heading, 5,500 feet from the drift mouth.

Section B (sample 10286) was cut from the face of left entry 14, off the main heading, 5,000 feet from the drift mouth.

Section C (sample 10262) was cut from the face of room No. 30 on left entry 12, 4,500 feet from the drift mouth.

Section D (sample 10287) was cut from the face of left entry 18, off the main heading, 6,500 feet from the drift mouth.

Section E (sample 10263) was cut from a pillar on right entry 2, off the main heading, 2,000 feet from the drift mouth.

A composite sample was made by mixing the four samples 10285, 10286, 10287, and 10262. The results of an ultimate analysis of this sample are shown under laboratory number 10292.

Notes.—In 1910 the coal in this mine was undercut in the bottom part of the bed by puncher machines and shot down with black blasting powder. The entire output was loaded as run-of-mine, one trimmer picking the coal as it was loaded on the cars. The mine had an estimated capacity of 800 tons and an average daily output in April, 1910, of 700 tons, the larger part of which was from advance workings. The output was expected to be increased to 900 tons in the near future. The mine was expected to produce coal for at least 10 years from the date of sampling, April, 1910.

For chemical analyses of this coal see part I of this bulletin, p. 155.

DALE. DALE MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3836 (p. 156).

Mine.—Dale; Central Pennsylvania district; at Dale near Johnstown.

Coal bed.—Upper Kittanning, known as the C′ or Cement. Carboniferous age, Allegheny formation. The roof is good, a hard sandy shale. There are 34 inches of coal, with a binder 1 foot from the top. The lower 6 inches of coal is hard and bony. The maximum thickness noted at the mine was 3½ feet, but the average thickness is 30 to 34 inches.

The bed was measured and sampled on August 4, 1906, by W. C. Phalen. The measurement showed 32 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 156; also U. S. Geol. Survey Bull. 316, pp. 24, 25.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

EAST CONEMAUGH. CONEMAUGH SLOPE MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3825 (p. 156).

Mine.—Conemaugh slope; in the Central Pennsylvania district; at East Conemaugh, northeast of Johnstown, on the Little Conemaugh River.

Coal bed.—Known as the Upper Freeport, or locally known as the Coke Yard. Carboniferous age, Allegheny formation.

The bed was measured and sampled on August 13, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Conemaugh slope mine at East Conemaugh.

Laboratory No.	3825	
Roof, bone.	*Ft.*	*in.*
Coal	3	2
Shale[a]	0	1
Coal[a]	0	4
Floor, clay.		
Thickness of bed	3	7
Thickness of coal sampled	3	2

[a] Not included in sample.

Note.—Output in 1910, 95,318 tons.

For chemical analyses of this coal see part I of this bulletin, p. 156; also U. S. Geol. Survey Bull. 316, pp. 24, 25.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

EHRENFELD. NO. 3 MINE.

Sample.—Semibituminous coal; Windber field; (Pennsylvania No. 8) analyses Nos. 2014, 2015 (p. 156).

Mine.—No. 3, a drift mine in the Central Pennsylvania district, at Ehrenfeld, on the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, locally known as the Miller. Carboniferous age, Allegheny formation. Thickness, uniform, averaging about 4 feet at this mine; dip, slight, westward. Roof, sandy shale or "slate;" floor, fire clay. The bed carries no regular partings and few "sulphur" bands. Above the coal that is mined is bony coal 3 feet 4 inches thick, which is not shipped. The bed shows a well-defined columnar structure.

The bed was measured and sampled at two points in the mine by W. J. von Borries, J. W. Groves, and J. S. Burrows, on August 16, 1905, as shown below:

Sections of coal bed in No. 3 mine at Ehrenfeld.

Section	A		B	
Laboratory No.	2014		2015	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bone [a]	0	3½	0	3
Coal	3	8½	1	1
Sulphur	..	..	0	⅛
Coal	..	..	2	8
Floor, fire clay.				
Thickness of bed	4	0	4	⅛
Thickness of coal sampled	3	8½	3	9⅛

[a] Not included in sample.

Section A (sample 2014) was measured in left heading 23, 2¼ miles from the drift mouth.

Section B (sample 2015) was measured in the face of the main entry, 2¾ miles from the drift mouth.

Notes.—The coal from this mine, like that from other mines working the same bed in this district, is rather soft and friable and is mostly shipped in run-of-mine form. It is largely used for steam production at manufacturing centers along the Atlantic seaboard. The rated output in 1905 was 1,500 tons a day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 179; Bureau of Mines Bull. 23, pp. 67, 177; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 180; Bureau of Mines Bull. 13, pp. 184, 275; coking tests: U. S. Geol. Survey Bull. 290, p. 181; Bull. 336, pp. 24, 31, 41; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 156; also U. S. Geol. Survey Bull. 290, p. 179; Bull. 316, pp. 24–25.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

EMEIGH. VICTOR NO. 15 MINE.

Sample.—Bituminous coal; Windber field; analyses Nos. 7968, 7970 (p. 156).

Mine.—Victor No. 15; in the Central Pennsylvania district; 2 miles north of North Barnesboro, at Emeigh.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation.

The bed was measured and sampled at two points in June, 1909, by C. Butts, as shown below:

Section of coal bed in Victor No. 15 mine, at Emeigh.

Laboratory No.	7968		7970	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal [a]	0	4½	..	..
Parting [a]	0	1¾	..	..
Coal [a]	0	4½	..	..
Shale [a]	0	8	..	..
Coal	0	5½	3	5
Parting [a]	0	1	0	1
Coal	2	6	0	3
Parting [a]	0	1	..	..
Coal	0	5	..	..
Floor, clay.				
Thickness of bed	5	1¼	3	9
Thickness of coal sampled	3	4½	3	8

[a] Not included in sample.

Sample 7970 was taken at face of heading.

For chemical analyses of this coal see part I of this bulletin, p. 157.

EXPEDIT (TWIN ROCKS). NONPAREIL NO. 1 AND NO. 3 MINES.

Sample.—Semibituminous coal; Windber field; analyses Nos. 3809, 3810 (p. 157).

Mines.—Nonpareil No. 1 and No. 3; in the Central Pennsylvania district at Twin Rocks (Expedit post office), near Big Bend, on the South Fork of Black Lick Creek.

Coal bed.—Lower Kittanning, also known as the Miller, or B. Carboniferous age, Allegheny formation.

The bed was sampled at one point in each mine by W. C. Phalen on September 19, 1906, as described below:

Section of coal bed in Nonpareil No. 1 and No. 3 mines, at Expedit.

Laboratory No	3809		3810	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Coal	3	8	3	9
Parting [a]	0	3½	0	4
Coal [a]	0	6	0	6
Parting [a]	0	4	0	1
Coal [a]	0	½	1	0
Floor, clay.				
Thickness of bed	4	10	5	8
Thickness of coal sampled	3	8	3	9

[a] Not included in sample.

Sample 3809 was taken in Nonpareil No. 1 mine.

Sample 3810 was taken in Nonpareil No. 3 mine in right heading 4.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, pp. 24–25.

FALLEN TIMBER. PEERLESS NO. 4 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 10278, 10279, 10298 (p. 157).

Mine.—Peerless No. 4; in the Central Pennsylvania district; a drift mine, at Fallen Timber, on the Cresson division of the Pennsylvania Railroad.

Coal bed.—Upper Freeport, known in this field as the E. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 2 feet 5 inches and varies from 2 feet to 2 feet 6 inches. Immediately above the coal is bone 3 to 4 inches in thickness. The roof is a dark shale of good quality, having a thickness of 8 feet and being overlain with sandstone. The floor is a medium hard clay with smooth surface.

The bed was measured and sampled at two points by R. Y. Williams on April 16, 1910, as described below:

Sections of coal bed in Peerless No. 4 mine, at Fallen Timber.

Section	A		B	
Laboratory No	10278		10279	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone, bone.				
Coal, soft bright	1	8⅝	1	10
Shale binder [a]	0	1½	0	¾
Coal, soft bright	0	6	0	5¾
Floor, medium hard clay.				
Thickness of bed	2	4⅛	2	4½
Thickness of coal sampled	2	2⅝	2	3¾

[a] Not included in sample.

Section A (sample 10278) was cut from the face of the right main entry, 1,250 feet from the drift mouth.

Section B (sample 10279) was cut from the face of the left main entry, 1,200 feet from the drift mouth.

A composite sample was made from the face samples 10278 and 10279. The results of an ultimate analysis of this sample are shown under laboratory No. 10298.

Notes.—The coal at this mine was overcut by hand in the top part of the bed and shot down with black powder. There were no screens, the entire output being loaded as run-of-mine coal. The mine had an estimated capacity of 50 tons and an average daily output at the time of inspection and sampling in April, 1910, of 45 tons, all of which was derived from advance workings. The output in 1910 was 4,874 tons.

For chemical analyses of this coal, see part I of this bulletin, p. 157.

FRANKLIN. FRANKLIN SLOPE NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3840 (p. 157).

Mine.—Franklin Slope No. 2; in the Central Pennsylvania district, at Franklin, east of Johnstown, on the slope of the Little Conemaugh River on the main line of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, Miller, or B. Carboniferous age, Allegheny formation. Roof, sandy shale; floor, clay or shale.

The bed was measured and sampled by W. C. Phalen. The measurement showed 43 inches of coal. The sample, taken on September 4, 1906, represented a 43-inch cut.

For chemical analyses of this coal, see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, pp. 24–25.

For geologic relations, see U. S. Geol. Survey Bull. 447, pp. 16–27.

FRANKLIN. FRANKLIN NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3841 (p. 157).

Mine.—Franklin No. 1; in the Central Pennsylvania district; east of Johnstown, at Franklin.

Coal bed.—Upper Kittanning, also known as the Cement and as the C′. Carboniferous age, Allegheny formation. Roof, sandstone.

The bed was measured and sampled on August 10, 1906, by W. C. Phalen. The sample represented 2 feet 4 inches of coal, which was overlain with sandstone and underlain with shale.

The limestone underlying this coal is responsible for the name that is sometimes applied to the bed, owing to the fact that formerly the limestone was used in the manufacture of cement.

For chemical analyses of this coal, see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations, see U. S. Geol. Survey Bull. 447, pp. 16–27.

HASTINGS. NO. 20 MINE.

Sample.—Semibituminous coal; Windber field; (Pennsylvania No. 16) analyses Nos. 4028, 4029 (p. 157.)

Mine.—No. 20, a drift mine in the Central Pennsylvania district, at Hastings, on the Pennsylvania Railroad.

Coal bed.—Lower Freeport or D of the Pennsylvania geological survey. Carboniferous age, Allegheny formation. Its thickness is fairly uniform, averaging 4 feet 4 inches at this mine. The bed lies nearly flat. The roof is of gray shale. The floor is a hard clay.

The bed was measured and sampled at two points in the mine by K. M. Way on October 25, 1906, as shown below:

Sections of coal bed in mine No. 20 at Hastings.

Section	A		B	
Laboratory No.	4028		4029	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	2½	0	2
Coal	1	8½	3	2½
Sulphur [a]	0	½	..	..
Shale [a]	..	..	0	1½
Coal	1	½	0	8½
Sulphur [a]	0	½	..	..
Coal	0	6½	..	..
Shale [a]	0	1½	..	..
Coal	0	9½	..	..
Floor, clay.				
Thickness of bed	4	6	4	2½
Thickness of coal sampled	4	1	3	11

[a] Not included in the sample.

Section A (sample 4028) was measured in room 19, off left heading 29, several hundred feet from opening.

Section B (sample 4029) was measured in right heading 24.

Notes.—The coal from this mine, like that from other mines working the same bed in this district, is friable, and is mostly shipped in run-of-mine form for steam production. The estimated capacity of the mine in 1906 was 150 tons a day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 205; Bureau of Mines Bull. 23, pp. 67, 178; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 206; Bureau of Mines Bull. 13, pp. 195, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 206.

For chemical analyses see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 332, p. 205.

JOHNSTOWN. FERNDALE MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3843 (p. 157).

Mine.—Ferndale; in the Central Pennsylvania district; south of Johnstown on the main road between Johnstown and Ferndale, on the west or left bank of Stony Creek opposite Moxham.

Coal bed.—Upper Freeport, E, or Coke Yard. Carboniferous age, Allegheny formation. Roof, sandstone.

The bed was measured and sampled on July 26, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Ferndale mine south of Johnstown.

Laboratory No.	3843	
Roof, shale.	*Ft.*	*in.*
Coal	3	2
Bone [a]	0	4
Black shale [a]	0	2
Coal	0	4
Thickness of bed	4	0
Thickness of coal sampled	3	6

[a] Not included in sample.

Note.—The output in 1910 was 11,200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

JOHNSTOWN. GREENHILL MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3838 (p. 157).

Mine.—Greenhill; Central Pennsylvania district; in the eastern part of Johnstown.

Coal bed.—Lower Kittanning, also known as the Miller or B. Carboniferous age, Allegheny formation. Roof, shale. The floor is an excellent clay which runs approximately 5 feet in thickness.

The bed was measured and sampled by W. C. Phalen, the sample representing 3 feet 6 inches of coal, on August 2, 1906.

Note.—The floor of the bed is a good clay and was shipped to one or more of the local potteries.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, pp. 24–25.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

JOHNSTOWN. LITSINGER MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3844 (p. 157).

Mine.—Litsinger; Central Pennsylvania district; east of Johnstown on Solomons Run.

Coal bed.—Upper Kittanning, Cement or C′. Carboniferous age, Allegheny formation. Roof, sandstone.

The bed was measured and sampled by W. C. Phalen, the sample representing 3 feet 1 inch of coal with no partings, on August 2, 1906.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, p. 16–27.

JOHNSTOWN. ROLLING MILL MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3833 (p. 157).

Mine.—Rolling Mill; in the Central Pennsylvania district; west of Johnstown, near the confluence of the Conemaugh River and Stony Creek.

Coal bed.—Upper Kittanning, or C′, known also as the Cement. Carboniferous age, Allegheny formation. The roof of the coal is shale or sandstone, underlain with 4 to 8 inches of bone. The coal measured was 3 feet to 3 feet 6 inches. The floor is shale, underlain with limestone.

The bed was measured and sampled on August 2, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Rolling Mill mine, west of Johnstown.

Laboratory No	3833	
Roof, shale or sandstone.	*Ft.*	*in.*
Bone [a] (varying up to 8 inches)	0	6
Coal (varying up to 3 feet 6 inches)	3	1
Shale [a] (varying up to 6 inches)	0	4
Floor, limestone.		
Thickness of bed	3	8
Thickness of coal sampled	3	1

[a] Not included in sample.

Note.—The output in 1910 was 725,236 tons.

For chemical analyses of this coal see part I of this bulletin, p. 157.

For geologic relations see U. S. Geol. Survey Bull. 447, p. 16–27.

JOHNSTOWN. STONY CREEK PROSPECT.

Sample.—Semibituminous coal; Windber field; analysis No. 4012, (p. 157).

Location.—Stony Creek prospect, Johnstown district, just above trolley bridge, between Ferndale and Moxham.

Coal bed.—Lower Freeport, or D of the State geological Survey and known locally as the Limestone coal. It is from 45 to 70 feet below the Upper Freeport coal. Immediately over the coal there is generally a few inches of bone and black shale, overlain with either sandy shale or massive sandstone, and its floor is clay. The section given below is characteristic in that the coal is in three distinct benches separated by thin shale or bone partings. The upper bench averages about 1 foot thick and the middle bench about 2 feet. It is possible that in the commercial development of this bed only these two beds will be worked and that the underlying coal and bone will serve as the floor. It may be said, therefore, that from 2½ to 3 feet of good coal is present.

The bed was measured and sampled by W. C. Phalen on October 20, 1906, as described below:

Section of coal bed in Stony Creek prospect, near Johnstown.

Laboratory No.	4012	
Roof, massive sandstone.	*Ft.*	*in.*
Coal	1	0
Shale or bone [a]	0	1
Coal	1	10
Shale or bone [a]	0	1
Coal	0	4
Floor, clay.		
Thickness of bed	3	4
Thickness of coal sampled	3	2

[a] Not included in sample.

The sample taken for analysis was obtained approximately 10 to 15 feet from the outcrop.

Notes.—This coal, like some others in the Johnstown district, is semibituminous, and is adapted for steaming and domestic purposes. Like other coals in this region, it is generally classed as a smokeless coal owing to its small percentage of volatile hydrocarbons. The coal was not mined at the time of sampling, but may be regarded as among the future workable coals of the district.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

JOHNSTOWN. SUNNYSIDE NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3834 (p. 157).

Mine.—Sunnyside No. 2; Central Pennsylvania district; on Stony Creek south of Johnstown, at Moxham.

Coal bed.—Upper Kittanning, Cement, or C′. Carboniferous age, Allegheny formation. Roof, black or sandy shale; 4 inches of bony coal; 15 inches of soft coal easily broken into soft fragments; 2 inches of dirty bony coal; 2 feet 4 inches of hard coal; floor, black shale.

The bed was measured and sampled on August 3, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Sunnyside No. 2 mine, south of Johnstown.

Laboratory No.	3834	
Roof, black or sandy shale.	*Ft.*	*in.*
Bony coal [a]	0	4
Soft coal	1	3
Bony coal (dirty) [a]	0	2
Coal, hard	2	4
Floor, black shale.		
Thickness of bed	4	1
Thickness of coal sampled	3	7

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 157; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

JOHNSTOWN. SUNNYSIDE MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10249, 10250, 10251, 10252, 10270 (p. 157).

Mine.—Sunnyside; Central Pennsylvania district; a drift mine, 1½ miles from Johnstown, on the Baltimore & Ohio Railroad and the Pennsylvania Railroad.

Coal bed.—Upper Kittanning or C′. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 9 inches, and varies from 3 feet 5 inches to 4 feet. The roof is a shale, having a thickness of 5 feet, and overlain with a cap rock. The floor is a hard "cement rock" with smooth surface.

The bed was measured and sampled at four points by A. J. Hazlewood on April 14, 1910, as described below:

Sections of coal bed in Sunnyside mine, 1½ miles from Johnstown.

Section	A		B		C		D	
Laboratory No	10249		10252		10251		10250	
Roof, slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone, coal, and sulphur [a]	..	..	1	0	1	2	..	..
Blue slate (soft)[a]	..	..	1	6	0	¼	..	..
Bone (brittle)[a]	0	2	..	2	0	4	0	4
Coal	3	7	1	0	1	0	1	0
Coal (hard gray)	..	..	0	1	0	½	..	1
Coal	..	..	2	5	0	11	2	5
Charcoal	..	..	..	..	0	½	..	..
Coal	..	..	..	..	1	6	..	..
Floor, hard "cement rock."								
Thickness of bed	3	9	6	2	5	¼	3	10
Thickness of coal sampled	3	7	3	6	3	6	3	6

[a] Not included in sample.

Section A (sample 10249) was cut from the face of the main entry.

Section B (sample 10252) was cut from the face of left entry 3.

Section C (sample 10251) was cut from the face of right entry 3.

Section D (sample 10250) was cut from the face of left entry 1, 4,800 feet from the drift mouth.

A composite sample was made by mixing the face samples 10249, 10250, 10251, and 10252 for an ultimate analysis, the results of which are shown under laboratory No. 10270.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed and was shot down with black blasting powder. There were no screens at the tipple, the entire output being loaded as run-of-mine coal. One trimmer picked the coal as it was loaded on the cars. The mine in 1909 at time of sampling had a capacity of 800 tons a day, and the average daily output was 600 tons, all of which was derived from advance workings. This was a new mine, and an increase of the output was expected.

For chemical analyses of this coal see part I of this bulletin, p. 157.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

LILLY. SONMAN NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10325, 10326, 10327, 10328 (pp. 158).

Mine.—Sonman No. 2; Central Pennsylvania district; a slope mine in Washington Township, at Lilly, on the Pennsylvania Railroad.

Coal bed.—Known in this field as the Lower Kittanning or B. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 4 inches, varying from 2 feet to 4 feet where mined. The roof is bony coal that stays up well, and has a thickness of from 8 to 16 inches, overlain with 8 to 24 inches of shale, above which is a hard cap rock. The floor is shale, generally smooth but has frequent small rolls; is hard at first but soon softens.

The bed was measured and sampled at three points by A. J. Hazlewood on April 22, 1910, as described below:

Sections of coal bed in Sonman No. 2 mine, at Lilly.

Section	A		B		C	
Laboratory No	10325		10326		10327	
Roof, hard bone coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	1	3	..	..
Coal (dull band)	0	1	0	1	..	..
Coal (very soft)	2	3	2	4	3	1½
Floor, hard slate.						
Thickness of bed	3	10	3	8	3	1½
Thickness of coal sampled	3	10	3	8	3	1½

Section A (sample 10325) was cut from the face of room 26, off left entry 7, 5,500 feet west from the mouth of the mine.

Section B (sample 10326) was cut from the face of room 9, off right entry 3, 5,000 feet north from the mouth of the mine.

Section C (sample 10327) was cut from a pillar in room 6, off right entry 2, 4,200 feet north of the drift mouth.

A composite sample was made by mixing the face samples 10325 and 10326 for an ultimate analysis the results of which are shown under laboratory No. 10328.

Notes.—The coal at this mine was undercut in the bottom part of the bed by hand pick, and was shot down with black powder. There were no screens at the tipple, the entire output being loaded as run-of-mine coal. Two trimmers picked the coal as it was loaded on the cars. The mine at time of sampling had a capacity of 1,000 tons a day, and an average daily output of 750 tons. Eighty per cent or more was taken from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 158.

LLOYDELL. CAMBRIA MINE.

Sample.—Semibituminous coal; Windber field; (Pennsylvania No. 18) analyses Nos. 4347, 4348 (p. 158).

Mine.—Cambria; a drift mine in the Central Pennsylvania district, at Lloydell, on the Pennsylvania Railroad.

Coal bed.—Miller. Carboniferous age, Allegheny formation. It lies nearly flat, and at this mine averages about 3½ feet thick. The roof is a massive gray shale and rather regular, but does not stand exposure well and requires considerable timbering. The floor is a clay, and is good to shovel from.

The bed was measured and sampled at two points in the mine by K. M. Way on December 20, 1906, as shown below:

Sections of coal bed in Cambria mine, at Lloydell.

Section	A		B	
Laboratory No	4347		4348	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4½	..	..
Bony coal [a]	..	..	0	1
Sulphur [a]	0	1¾	..	..
Coal	3	1¾	0	11
Sulphur	..	..	0	⅛
Coal	..	..	0	1¼
Sulphur	..	..	0	⅛
Coal	..	..	2	2½
Floor, clay.				
Thickness of bed	3	8	3	4
Thickness of coal sampled	3	6¼	3	3

[a] Not included in sample.

Section A (sample 4347) was measured in room 10, off left entry 3, 2,500 feet south of the drift mouth.

Section B (sample 4348) was taken from the face of left heading 5, 3,200 feet south of the drift mouth.

Notes.—The coal from this mine, like that from many other mines working in this district, is soft and easily shattered in mining. It was shipped in run-of-mine form for steam production. The approximate daily output of the mine in 1906 was 250 tons.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 211; Bureau of Mines Bull. 23, pp. 67, 178; briquetting tests: U. S. Geol. Survey Bull. 332, p. 211.

For chemical analyses see part I of this bulletin, p. 158; also U. S. Geol. Survey Bull. 332, p. 210.

NANTY GLO. CARDIFF MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 381, 382, 383, 384, 10452 (p. 159).

Mine.—Cardiff; Central Pennsylvania district; a drift mine, 2 miles north of Nanty Glo, on the Cresson Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B of the Pennsylvania survey. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 6 inches, and varies from 3 feet 3 inches to 3 feet 9 inches. The roof is a gray shale of good quality. The floor is a hard underclay, with smooth surface.

The bed was measured and sampled at four points by G. S. Pope on April 16, 1910, as described below:

Sections of coal bed in Cardiff mine, at Nanty Glo.

Section	A		B		C		D	
Laboratory No.	381		382		383		384	
Roof, gray slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	10¼	1	9½	0	11	0	9½
Coal (hard gray)	0	1¾	..	..	0	10¾	0	1½
Coal	0	10½	..	..	..	..	..	..
Sulphur	Trace.		0	¼	[a]0	¼	..	..
Coal	0	3½	0	2¾	0	11½	0	4½
Charcoal	Trace.		..	..	..	..	..	..
Coal	0	4¼	..	..	..	..	..	..
Sulphur	0	¼	[a]0	1	..	..	..	..
Coal	0	2¼	..	..	..	..	..	..
Coal (hard)	0	1½	..	..	..	..	..	..
Coal	0	4½	1	2	0	9½	2	1½
Floor, hard, smooth underclay.								
Thickness of bed	3	2¾	3	3½	3	7	3	5
Thickness of coal sampled	3	2¾	3	2½	3	6¾	3	5

[a] Not included in sample.

Section A (sample 381) was cut from the face of the main entry, 4,000 feet from the drift mouth.

Section B (sample 382) was cut from the face of left entry 7, 2,800 feet from the drift mouth.

Section C (sample 383) was cut from the face of right entry 6, 2,100 feet from the drift mouth.

Section D (sample 384) was cut from the face of left entry 5, 1,800 feet from the drift mouth.

A composite sample was made by mixing the face samples 381, 382, 383, and 384 for an ultimate analysis, the results of which are shown under laboratory No. 10452.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed and was shot down by permissible explosives. There were no screens, the entire output being loaded in run-of-mine form. Seven tipplemen and trimmers picked the coal as it was loaded on the cars. The mine had a capacity of 800 tons a day, and an average daily output of 600 tons, obtained from both advance and pillar workings. The output was expected to be gradually increased.

For chemical analyses of this coal see part I of this bulletin, p. 159.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

NANTY GLO. NO. 14 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3855 (p. 159).

Mine.—No. 14; Central Pennsylvania district; at Nanty Glo.

Coal bed.—Lower Kittanning, B, or Miller. Carboniferous age, Allegheny formation.

The bed was measured and sampled on September 22, 1906, by W. C. Phalen, as shown below:

Section of coal bed in No. 14 mine, at Nanty Glo.

Laboratory No	3855 No. 14.	
Roof, sandstone or shale.	*Ft.*	*in.*
Coal	3	9
Bone [a]	1	2
Coal	0	6
Floor, sandstone.		
Thickness of bed	5	5
Thickness of coal sampled	3	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 159; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

NANTY GLO. LINCOLN MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3889 (p. 159).

Mine.—Lincoln; Central Pennsylvania district; on the south branch of Black Lick Creek, about ½ mile northeast of Nanty Glo, on the Cambria & Clearfield Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, Miller, or B. It is the lowest important coal of the Allegheny formation and is approximately 100 feet above the top of the Pottsville formation. At this mine it is uniform in thickness and dips southeast at a very low angle. Its roof is shale, or in places sandstone; its floor is clay. It is 100 to 200 feet under cover where mined. Only the main bench is mined, and the under coal represented in the section given below is not touched.

The bed was measured and sampled on September 25, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Lincoln mine, northeast of Nanty Glo.

Laboratory No	3889	
Roof, shale, sometimes sandstone.	*Ft.*	*in.*
Coal	3	8
Shale [a]	0	3
Coal [a] (average)	0	2½
Floor, clay.		
Thickness of bed	4	1½
Thickness of coal sampled	3	8

[a] Not included in sample.

The exact position in the mine from which the sample was obtained was not noted.

Notes.—The coal from this mine has a maximum thickness of 3 feet 10 inches and a minimum thickness of 3 feet. The coal in this general region is made up of a main bench 3½ to 4 feet thick, below which there may be one or two thinner benches. At this particular mine only one of these lower benches was noted. Below the lowermost bench occurs a good body of clay which as a rule is not exploited along Black Lick

Creek. The roof of the coal is very firm shale or sandstone. The irregularity of the floor and the general absence of clay layers are characteristic. The coal is bright and lustrous, with a marked tendency to columnar cleavage. Most of this coal was used as a steaming coal in 1906. It was shipped to the seaboard.

For chemical analyses of this coal see part I of this bulletin, p. 159; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

PATTON. BROWN BANK.

Sample.—Semibituminous coal; Windber field; analysis No. 7962 (p. 159).

Location.—Brown bank; Central Pennsylvania district; 1 mile north of Patton.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation. Roof, shale.

The bed was measured and sampled on June 10, 1909, by Charles Butts, as shown below:

Section of coal bed in the Brown bank, 1 mile north of Patton.

Laboratory No	7962	
Roof, shale.	*Ft.*	*in.*
Coal	2	4
Clay [a]	1	0
Coal [a]	0	2
Thickness of bed	3	6
Thickness of coal sampled	2	4

[a] Not included in sample.

The sample was taken 300 feet from the mouth.

For chemical analyses of this coal see part I of this bulletin, p. 159.

PATTON. MOSHANNON NO. 33 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 7959, 7955, 7965, 9761 (p. 159).

Mine.—Moshannon No. 33; Central Pennsylvania district; at Patton.

Coal bed.—Upper Kittanning or C′. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 7, 1909, by Charles Butts, as shown below:

Section of coal bed in Moshannon No. 33 mine at Patton.

Laboratory Nos	7959		7955		7965		7961	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, cannel luster; in streaks hard	1	9	..	..	[a] 0	8	..	..
Coal	2	5	0	4	3	7	3	10
Shale	..	..	[a] 0	1½	..	..	..	..
Coal	..	..	0	3	..	..	..	..
Shale	..	..	[a] 0	½	..	..	..	..
Coal	..	..	[a] 0	1¾	..	..	..	..
Shale	..	..	0	1	..	..	..	..
Coal	..	..	0	4	..	..	..	..
Shale	..	..	[a] 0	½	..	..	..	..
Coal	..	..	0	1	..	..	..	..
Coal, dirty (not mined)	..	..	..	..	[a] 1	5	[a] 1	8
Thickness of bed	4	2	....		5	8	5	6
Thickness of coal sampled	4	2	1	1¾	3	7	3	10

[a] Not included in sample.

Sample 7959 was taken in heading 18, off main heading 2.

Sample 7955 was taken in heading 18, off main heading 2.

Sample 7965 was taken in heading 21, off main heading 1.

Sample 7961 was taken in left heading 6, off level 2.

For chemical analyses of this coal see part I of this bulletin, p. 159.

PORTAGE. MILLER NO. 1 SHAFT.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10293, 10294, 10295, 10296, 10297, 10300 (p. 159).

Mine.—Miller No. 1 shaft; Central Pennsylvania district; a shaft mine 425 feet deep, 1 mile southeast of Portage, on the main line of the Western Pennsylvania Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 6 inches, and varies from 2 feet to 4 feet 6 inches. Immediately above the coal bed is a draw slate 4 inches in thickness. The roof is a dark shale of good quality, having a thickness of 18 inches, and overlain with a sandstone. The floor is a medium hard clay with smooth surface.

The bed was measured and sampled at five points by R. Y. Williams on April 19, 1910, as described below:

Sections of coal bed in Miller No. 1 shaft, 1 mile southeast of Portage.

Section	A		B		C		D		E	
Laboratory No	10293		10294		10295		10296		10297	
Roof, draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top grainy coal	[a] 0	6½	[a] 0	¾	[a] 0	5½	[a] 0	3	[a] 0	4
Sulphur clay	..	..	..	..	..	..	[a] 0	¾	..	..
Coal (soft bright)	0	10¾	1	2	0	11⅝	0	10½	0	6⅜
Coal (gray)	0	¼	0	½	0	½	0	½	0	½
Coal (soft bright with charcoal)	1	3⅜	2	2⅛	0	8½	1	8⅛	2	2
Sulphur streak or charcoal	0	¼	..	..	0	¼	[a] 0	¼	..	..
Coal (soft bright)	..	..	..	..	..	..	0	2⅞	..	..
Sulphur streak	..	..	..	..	..	..	[a] 0	½	..	..
Coal (soft bright)	1	2⅝	..	..	1	7⅜	0	6¼	..	..
Floor, medium hard underclay.										
Thickness of bed	3	11¾	3	5⅜	3	9¾	3	8¾	3	⅞
Thickness of coal sampled	3	5¼	3	4⅝	3	4¼	3	4¼	2	8⅞

[a] Not included in sample.

Section A (sample 10293) was cut from the face of room No. 1 on right entry 1, 1,000 feet from the shaft bottom.

Section B (sample 10294) was cut from the face of left air course 1, off right entry 2, 3,000 feet from the shaft bottom.

Section C (sample 10295) was cut from the face of the straight main entry, 4,500 feet from the shaft bottom.

Section D (sample 10296) was cut from the face of east heading 4, 3,000 feet from the shaft bottom.

Section E (sample 10297) was cut from the face of right entry 1, off left heading 1, 2,500 feet from the shaft bottom.

A composite sample was made by mixing the face samples 10293, 10294, 10295, 10296, and 10297 for an ultimate analysis, the results of which are shown under laboratory No. 10300.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed, and was shot down with black powder. There were no screens at the tipple (except to take the lump from the coal going to the boilers), the entire output being loaded as run-of-mine coal. The mine was a comparatively new one, having a daily capacity in April, 1910, of 700 tons. The output was to be steadily increased to 1,500 tons. In 1910 the coal was coming from advance workings. The probable lifetime of the mine was 30 years.

For chemical analyses of this coal see part I of this bulletin, p. 159.

PORTAGE. PURITAN NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10288, 10289, 10290, 10291, 10299 (p. 160).

Mine.—Puritan No. 1, Central Pennsylvania district; a shaft mine, 154 feet deep, 2½ miles southeast of Portage on the main line of the Western Pennsylvania Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B of the Pennsylvania reports. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 6 inches, and varies from 2 feet 6 inches to 5 feet. Immediately above the coal bed is a "draw slate" 4 inches in thickness. The roof is a dark shale of good quality, having a thickness of 2 feet and overlain with a sandstone. The floor is a smooth hard shale 4 inches in thickness, underlain with 3 inches of coal, below which is underclay.

The bed was measured and sampled at four points by R. Y. Williams on April 18, 1910, as described below:

Sections of coal bed in Puritan No. 1 mine, 2½ miles southeast of Portage.

Section	A		B		C		D	
Laboratory No.	10288		10289		10290		10291	
Roof, draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in*
Top grainy coal	[a]0	3	[a]0	3½	[a]0	3	[a]0	2
Coal (soft bright)	1	0½	3	0	1	2¾	..	..
Coal (hard gray)	0	1	..	..	..	..	..	..
Charcoal and sulphur	..	..	[a]0	5	0	⅛	..	..
Coal (soft bright)	2	4⅝	..	..	2	6⅝	3	7¼
Floor, hard slate.								
Thickness of bed	3	9⅛	3	8½	4	½	3	9¼
Thickness of coal sampled	3	6⅛	3	0	3	9½	3	7¼

[a] Not included in sample.

Section A (sample 10288) was cut from the face of dip level 1, 13,600 feet from the shaft bottom.

Section B (sample 10289) was cut from the face of the upper inside level, 13,300 feet from the shaft bottom.

Section C (sample 10290) was cut from the face of right entry 1, off the new slope, 1,500 feet from the shaft bottom.

Section D (sample 10291) was cut from the face of left entry 1, off the new slope, 1,400 feet from the shaft bottom.

A composite sample was made by mixing the face samples 10288, 10289, 10290, and 10291 for an ultimate analysis, the results of which are shown under laboratory No. 10299.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed and was shot down with black blasting powder. There were no screens, the entire output being loaded as run-of-mine coal. Two trimmers picked the coal as it was loaded on the cars. The mine had a daily capacity of 500 tons, and an average daily output of 400 tons, most of which was derived from advance workings. Increase of the output to 800 tons a day was contemplated.

For chemical analyses of this coal see part I of this bulletin, p. 160.

St. Benedict. Victor No. 6 Mine.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7954, 7956 (p. 160).

Mine.—Victor No. 6; Central Pennsylvania district; at St. Benedict.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation. Roof, shale; floor, clay.

The bed was measured and sampled on June 10, 1909, by Charles Butts, as shown below:

Section of coal bed in Victor No. 6 mine at St. Benedict.

Laboratory No.	7954		7956	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal[a]	0	3	0	3
Coal	3	1	2	6½
Shale[a]	0	1	0	1
Coal	0	5	0	7½
Floor, clay.				
Thickness of bed	3	10	3	6
Thickness of coal sampled	3	6	3	2

[a] Not included in sample.

Sample 7954 was taken from main heading, 5,850 feet from the mine mouth.

Sample 7956 was taken in left heading 7.

For chemical analyses of this coal see part I of this bulletin, p. 160.

ST. BENEDICT. VICTOR NO. 10 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7960, 7966 (p. 160).

Mine.—Victor No. 10; Central Pennsylvania district; at St. Benedict.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation. Roof, shale; floor, clay.

The bed was measured and sampled on June 9, 1909, by Charles Butts, as shown below:

Section of coal bed in Victor No. 10 mine at St. Benedict.

Laboratory No.	7960		7966	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal[a]	1	6	1	5
Coal	2	3	2	7
Floor, clay.				
Thickness of bed	3	9	4	0
Thickness of coal sampled	2	3	2	7

[a] Not included in sample.

Sample 7960 was taken in right heading 2.

Sample 7966 was taken near tail of heading toward No. 9 mine.

For chemical analyses of this coal see part I of this bulletin, p. 160.

ST. BONIFACE. PARDEE NO. 27 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7964, 7967 (p. 160).

Mine.—Pardee No. 27; Central Pennsylvania district; at St. Boniface.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation. Roof, sandstone and black shale; floor, clay.

The bed was measured and sampled on June 9, 1909, by Charles Butts, as shown below:

Section of coal bed in Pardee No. 27 mine, at St. Boniface.

Laboratory No.	7964		7967	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, with short clayey partings ½ inch thick or less	3	8	..	..
Shale[a]	0	1	..	..
Coal	0	6	..	..
Coal, bright, soft	..	..	1	5
Coal, harder and not so bright	..	..	1	1
Coal, bright, soft	..	..	0	6
Parting[a]	..	..	0	1
Coal, bright and soft	..	..	0	6
Floor, clay.				
Thickness of bed	4	3	3	7
Thickness of coal sampled	4	2	3	6

[a] Not included in sample.

Sample 7964 was taken from main heading.

Sample 7967 was taken 8 yards from main heading, 600 feet from the pit mouth.

For chemical analyses of this coal see part I of this bulletin, p. 160.

SOUTH FORK. PRISCILLA NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 7624, 7625 (p. 161).

Mine.—Priscilla No. 1; Central Pennsylvania district; a drift mine at South Fork, on the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, B, or Miller. Carboniferous age, Allegheny formation. Roof and floor, black shale; thickness, from 3 feet 10 inches to 4 feet 4 inches. The bed was measured and sampled by G. S. Pope on April 20, 1909, as shown below:

Sections of coal bed in Priscilla No. 1 mine, at South Fork.

Laboratory No.	7625		7624	
	Ft.	*in.*	*Ft.*	*in.*
Roof, black slate.				
Bone coal [a]	0	8	0	4½
Coal	0	8	0	8½
Black slate	0	¾	0	½
Coal	1	½	1	½
Sulphur [a]	0	¼	..	..
Bone coal [a]	..	..	0	¾
Coal	1	..	1	6½
Bone coal	0	¼	..	..
Coal	0	10	1	0
Floor, black slate.				
Thickness of bed	4	3¾	4	9¼
Thickness of coal sampled	3	7½	4	4

[a] Not included in sample.

Sample 7625 was taken 1,300 feet north of opening in room 8, off heading 7.

Sample 7624 was taken 2,300 feet north of opening in face of main heading.

Notes.—All coal was picked. The daily output at time of sampling was 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. STINEMAN NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3786 (p. 161).

Mine.—Stineman No. 1; Central Pennsylvania district; at South Fork.

Coal bed.—Lower Kittanning, Miller, or B. Carboniferous age, Allegheny formation. Shale roof; 48 inches of coal, 3 to 12 inches of parting, and 2 to 8 inches of coal. The bed was measured and sampled on August 31, 1906, by W. C. Phalen, as shown below:

Section of coal bed in No. 1 mine at South Fork.

Laboratory No.	3786	
	Ft.	*in.*
Roof, shale or sandstone.		
Coal	3	6
Shale [a]	1	0
Coal (variable) [a]	0	9
Floor, clay.		
Thickness of bed	5	3
Thickness of coal sampled	3	6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 161; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. STINEMAN NO. 5 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3784 (p. 161).

Mine.—Stineman No. 5; Central Pennsylvania district, at South Fork.

Coal bed.—Upper Freeport, E, or Lemon. Carboniferous age, Allegheny formation. Roof, shale; floor, clay.

The bed was measured and sampled on August 30, 1906, as shown below:

Section of coal bed in Stineman No. 5 mine, at South Fork.

Laboratory No.	3784
Roof, shale.	*Ft. in.*
Coal [a]	0 3
Parting [a]	0 ¾
Coal	0 10
Parting [a]	0 2
Coal	1 8
Floor, clay.	
Thickness of bed	2 11¾
Thickness of coal sampled	2 6

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 161; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. STINEMAN NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 9041, 9042, 9043, 9044, 9045, 9071 (p. 161).

Mine.—Stineman No. 2; Central Pennsylvania district; a drift mine at South Fork, on the main line of the Pennsylvania Railroad.

Coal bed.—Known in this field as the Lower Kittanning or B. Carboniferous age, Allegheny formation. The coal at this mine averages 4 feet in thickness, and varies from 1½ to 4½ feet. It is fairly regular in character, has a gray shale roof, and a hard clay floor with smooth surface.

The bed was measured and sampled at five points by H. M. Wolflin on September 7, 1909, as described below:

Sections of coal bed in Stineman No. 2 mine at South Fork.

Section	A	B	C	D	E
Laboratory No.	9041	9042	9043	9044	9045
Roof, shale.	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*
Bone coal [a]	0 4	.. ..	0 7	0 4	0 ½
Coal	1 1	0 11	1 1¼	1 ¾	1 7½
Bone coal	0 2	0 ¼	0 ¼	0 ¼	.. ..
Coal (tough gray)	.. ..	0 8	.. ..	.. ..	1 7
Pyrites [a]	.. ..	0 ¾	.. ..	.. ..	.. ..
Coal	2 7	2 ½	2 8	2 8½	1 0
Floor, hard underclay.					
Thickness of bed	4 2	3 8½	4 4½	4 1½	4 3
Thickness of coal sampled	3 10	3 7¾	3 9½	3 9½	4 2½

[a] Not included in sample.

Section A (sample 9041) was cut from the face of west entry 13, off the main entry, 10,200 feet S. 45° W. from the drift mouth.

Section B (sample 9042) was cut from the face of west entry 12, off the main entry, 11,000 feet south 50° W. from the drift mouth.

Section C (sample 9043) was cut from the face of west entry 11, off the main entry, 11,500 feet S. 15° W. from the drift mouth.

Section D (sample 9044) was cut from the face of new west entry 10, off the main entry, 11,400 feet S. 80° W. from the drift mouth.

Section E (sample 9045) was cut from pillar of room 16, off west entry 9, off the main entry, 10,100 feet S. 85° W. from the drift mouth.

A composite sample was made by mixing the face samples 9041, 9042, 9043, and 9044 for an ultimate analysis, the results of which are shown under laboratory number 9071.

Notes.—The coal at this mine was undercut with hand picks and shot down with black powder. As the tipple had no screens, the coal was loaded in run-of-mine form. The coal was picked by one trimmer as it was loaded on the cars. The capacity of the mine in 1909 was 750 tons, the actual average output being 650 tons daily. The future output was to be derived from pillars and advance work. The mine had 600 acres of solid coal to work out, and the company was considering an increase of the capacity of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. STINEMAN NO. 4 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 9037, 9038, 9039, 9040, 9070 (p. 161).

Mine.—Stineman No. 4; Central Pennsylvania district; a slope mine at South Fork, on the main line of the Pennsylvania Railroad.

Coal bed.—Known in this field as the Lower Kittanning or B. Carboniferous age, Allegheny formation. The coal as mined averages 2 feet 10 inches in thickness, varying from 2½ to 4½ feet. The roof is a gray shale, about 6 inches of which comes down as a "draw slate," and to which the coal sticks. The floor is a hard shaly clay with a smooth surface. The dip of the coal is 12° S. 60° W.

The bed was measured and sampled at four points by H. M. Wolflin on September 2 and 9, 1909, as described below:

Sections of coal bed in Stineman No. 4 mine at South Fork.

	A		B		C		D	
Laboratory No.	9037		9038		9039		9040	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	[a] 0	3½	..	..	[a] 0	3	[a] 0	7
Coal	[a] 0	4	0	7	0	8	0	3¾
Shale	[a] 0	¼	..	..	..	..	..	..
Coal	0	7	..	..	..	..	..	..
Bony coal	0	½	0	¼	0	¼	0	¼
Coal (gray)	..	..	0	8½	0	7	1	0
Coal	2	5½	1	8¾	1	5¾	1	2
Floor, hard underclay.								
Thickness of bed	3	8¾	3	½	3	0	3	1
Thickness of coal sampled	3	1	3	½	2	9	2	6

[a] Not included in sample.

Section A (sample 9037) was cut from the face of right entry 8, off new dip entry.

Section B (sample 9038) was cut from pillar No. 9 on right entry 18 off the main entry.

Section C (sample 9039) was cut from the face of room 3, off right slant, off right entry 16, off the main entry.

Section D (sample 9040) was cut from the face of right entry 16, off the main entry.

A composite sample was made by mixing the face samples 9037, 9039, and 9040 for an ultimate analysis, the results of which are shown under laboratory number 9070.

Notes.—The coal at this mine was undercut with hand picks and shot down with black blasting powder. The tipple had no screens, all the coal being loaded in run-of-mine form. The coal was cleaned by one trimmer as it was loaded on the cars. There were 600 acres to be worked out by this mine. The capacity of the mine was

700 tons at time of sampling in 1909, and the average daily output was 550 tons. The future supply was to be from both pillars and advance work.

For chemical analyses of this coal see part I of this bulletin, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. STINEMAN NO. 6 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3785 (p. 161).

Mine.—No. 6; Central Pennsylvania district; at South Fork.

Coal bed.—Upper Kittanning, C′, or Cement. Carboniferous age, Allegheny formation. Roof, shale and bone; main bench of coal, 42 inches; floor, clay or limestone. Maximum thickness of coal noted, 3 feet 4 inches, minimum 10 inches. No partings.

The bed was measured and sampled on August 30, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Stineman No. 6 mine, at South Fork.

Laboratory No.	3785	
Roof, shale or bone.	*Ft.*	*in.*
Bony coal [a]	0	5
Coal	3	6½
Floor, clay.		
Thickness of bed	3	11½
Thickness of coal sampled	3	6½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 161; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. WICKES MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3788 (p. 162).

Mine.—Wickes; Central Pennsylvania district; at Brookville, near South Fork.

Coal bed.—Brookville (A). Carboniferous age. Allegheny formation. Roof, shale; floor, clay. This coal is known locally as the 6-foot or dirty A coal.

The bed was measured and sampled on August 30, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Wickes mine, near South Fork.

Laboratory No.	3788	
Roof, shale.	*Ft.*	*in.*
Coal	3	6
Bone [a]	0	1
Coal	1	0
Floor, clay.		
Thickness of bed	4	7
Thickness of coal sampled	4	6

[a] Not included in sample.

For chemical analyses see part I of this bulletin, p. 162.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

SOUTH FORK. ARGYLE NO. 3 MINE.

Sample.—Semibituminous coal; Winder field; analysis No. 3787 (p. 162).

Mine.—Argyle No. 3; Central Pennsylvania district; a drift mine, 1 mile northwest of South Fork, on the Pittsburgh Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, Miller, White Ash, or B. It is the lowest important coal of the Allegheny formation, and is approximately 70 feet above the top of the

Pottsville, which is the next lower formation. It is extremely uniform, and in this locality is nearly flat, as it is located near the summit of an anticlinal axis. The roof of the coal is firm shale, shaly sandstone, or sandstone; the bony coal at the top of the main bench is discarded in mining; the floor is clay. A lower bench of coal occurs below the main bed near the outcrop, but disappears under cover. It is about 250 feet under cover where mined.

The bed was measured and sampled at one place by W. C. Phalen on August 30, 1906, and a section of the coal is given below.

Section of coal bed in Argyle No. 3 mine, at South Fork.

Laboratory No	3787
Roof, shale, sandy shale, or sandstone.	*Ft. in.*
Bony coal[a]	0 4
Coal	3 5
Floor, clay.	
Thickness of bed	3 9
Thickness of coal sampled	3 5

[a] Not included in sample.

Notes.—The thickness of the main bench of the Lower Kittanning coal near South Fork averages nearly 4 feet, and in places 5 feet, with no partings. The double structure alluded to above is characteristic about South Fork. Its roof of dense shale or sandstone, the general absence of "draw slate" or "clay veins," and the irregular floor are all characteristics of this bed around South Fork. The top few inches of coal is usually bony and is discarded. In appearance the coal is lustrous and much of it is iridescent. Its columnar cleavage is one of its more characteristic features. It was used principally as a steaming coal, some of it in the locomotives of the Pennsylvania Railroad. The run-of-mine coal was shipped in large quantities to the seaboard.

For chemical analyses of this coal see part I of this bulletin, p. 162; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

VAN ORMER. PEERLESS NO. 1 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 10275, 10276, 10277, 10281 (p. 162).

Mine.—Peerless No. 1; Central Pennsylvania district; a drift mine at Van Ormer, on the Cresson Division of the Pennsylvania Railroad.

Coal bed.—Upper Freeport or E. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet, and varies from 2 feet 6 inches to 3 feet 2 inches. Immediately above the coal bed is a "draw slate" 3 to 4 inches in thickness.

The roof is a strong gray shale of good quality. The floor is a medium hard clay with smooth surface.

The bed was measured and sampled at three points by R. Y. Williams on April 16, 1910, as described below:

Sections of coal bed in Peerless No. 1 mine at Van Ormer.

Section	A	B	C
Laboratory No	10275	10276	10277
Roof, strong gray shale.	*Ft. in.*	*Ft. in.*	*Ft. in.*
Bone[a]	0 4	0 4½	0 2¾
Coal (soft bright with charcoal)	2 3	2 2	2 3
Slate binder[a]	0 ¾	0 ¼	0 2
Coal (soft bright)	0 4½	0 6½	0 6½
Floor medium hard underclay.			
Thickness of bed	3 ¼	3 1¼	3 2¼
Thickness of coal sampled	2 7½	2 8½	2 9½

[a] Not included in sample.

Section A (sample 10275) was cut from the face of the straight entry, 3,000 feet from the drift mouth.

Section B (sample 10276) was cut from the face of the Gregg heading, 3,500 feet from the drift mouth.

Section C (sample 10277) was cut from the face of the Bader heading, 4,500 feet from the drift mouth.

A composite sample was made by mixing the face samples 10275, 10276, and 10277 for an ultimate analysis, the results of which are shown under laboratory No. 10281.

Notes.—The coal at this mine was overcut by hand in the top part of the bed, and was shot down with black blasting powder. There were no screens, the entire output being loaded in run-of-mine form. The mine had a capacity of 120 tons, and an average daily output of 90 tons, most of which at time of inspection and sampling in April, 1910, was derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 162.

For geologic relations see U. S. Geol. Survey Bull. 447, p. 64.

VAN ORMER. PEERLESS NO. 2 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 10272, 10273, 10274, 10280 (p. 162).

Mine.—Peerless No. 2; Central Pennsylvania district; a drift mine at Van Ormer, on the Cresson Division of the Pennsylvania Railroad.

Coal bed.—Lower Freeport or D. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 2 inches, varying from 2 feet 10 inches to 3 feet 10 inches. Immediately above the coal is a "draw slate," 6 to 8 inches in thickness. The roof is a dark shale of good quality, having a thickness of 8 feet, and overlain with a sandstone. The floor is medium hard clay with smooth surface.

The bed was measured and sampled at three points by R. Y. Williams on April 16, 1910, as described below:

Sections of coal bed in Peerless No. 2 mine at Van Ormer.

Section	A		B		C	
Laboratory No	10272		10273		10274	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, dark slate.						
Top grainy coal and bone [a]	0	4½	0	5	0	4
Coal (soft bright)	0	10	0	11½	0	10
Coal (hard gray)	0	1	0	1½	0	1
Coal (soft bright)	0	11	0	11	0	10½
Shale [a]	0	1	0	1	0	1½
Coal (soft bright)	0	10¼	1	1¾	0	6
Sulphur band [a]	..	..	..	..	0	½
Coal (soft bright)	..	..	..	..	0	7⅝
Floor, medium hard underclay.						
Thickness of bed	3	1¾	3	7¾	3	5⅛
Thickness of coal sampled	2	8¼	3	1¾	2	11⅛

[a] Not included in sample.

Section A (sample 10272) was cut from the face of left heading 7, 3,500 feet from the drift mouth.

Section B (sample 10273) was cut from the face of the main heading, 4,000 feet from the drift mouth.

Section C (sample 10274) was cut from the pillar on the new haulage heading, 3,400 feet from the drift mouth.

A composite sample was made by mixing the face samples 10272 and 10273 for an ultimate analysis, the results of which are shown under laboratory No. 10280.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed, and shot down with black blasting powder. There were no screens, the entire output being loaded in run-of-mine form. The mine had a capacity of 480 tons, and an average daily output at time of inspection and sampling in April, 1910, of 250 tons, 80 per cent of which was derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 162.

VINTONDALE. VINTON NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 3832, 318, 319, 320, 321, 322, 10459 (pp. 162, 163).

Mine.—Vinton No. 1; Central Pennsylvania district; a drift mine, on Black Lick Creek, at Vintondale, near the northern edge of the Johnstown quadrangle, on the Cambria and Clearfield Division of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, Miller, White Ash, or B. It is the lowest important coal of the Allegheny formation, and is approximately 100 feet above the top of the Pottsville, which is the next lower formation. It is rather uniform, and in this region dips about 200 feet per mile to the northwest to the Barnesboro syncline, to the northwest of which it rises gradually. The roof of the coal is excellent and is usually firm shale or sandstone. Its floor is clay and somewhat irregular. The coal is bright and lustrous, with a marked tendency to columnar cleavage. Only the main bench is worked in the section given below, but it is a common characteristic of this coal in this general region to have a lower and thinner bench which is not mined. The bed as mined has an average thickness of 3 feet 6 inches, and varies from 2 feet to 4 feet 6 inches. No clay veins as a rule are present. The thickness of the lower bench of coal is 2 to 10 inches, and is separated from the main coal by 8 to 10 inches of shale.

This bed was measured and studied at several points by W. C. Phalen on September 15, 1906, and was sampled in one place in the mine as shown below:

Section of coal bed in Vinton No. 1 mine, at Vintondale.

Laboratory No	3832	
Roof, hard shale.	*Ft.*	*in.*
Coal	3	7
Bone [a]	1	0
Floor, clay.		
Thickness of bed	4	7
Thickness of coal sampled	3	7

[a] Not included in sample.

The bed was also measured at five points by G. S. Pope on April 15, 1910, as described below:

Sections of coal bed in Vinton No. 1 mine, at Vintondale.

Section	A		B		C		D		E	
Laboratory No	322		320		321		318		319	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in*	*Ft.*	*in.*
Coal	..	..	..	..	1	3	..	..	0	1¾
Sulphur [a]	..	..	..	..	..	..	..	..	0	¼
Coal (hard and tough)	..	..	0	11	0	7	..	..	0	10
Sulphur [a]	..	..	0	¼	..	..	..	..	..	..
Coal	1	10¼	1	2½	0	9	1	7	0	9¾
Sulphur [a]	0	⅜	0	¼	0	¼	0	⅜	..	..
Coal	1	6½	1	3	1	7¼	1	11¼	1	7½
Floor, hard underclay.										
Thickness of bed	3	5⅛	3	5	4	2½	3	6⅝	3	5¼
Thickness of coal sampled	3	4¾	3	4½	4	2¼	3	6¼	3	5

[a] Not included in sample.

Section A (sample 322) was cut from the face of heading 10, off left entry 2, 6,000 feet from the drift mouth.

Section B (sample 320) was cut from the face of left heading 1, off dip entry 2, 4,000 feet from the drift mouth.

Section C (sample 321) was cut from the face of heading 10, off right entry 4, 7,000 feet from the drift mouth.

Section D (sample 318) was cut from the face of slope 4, 2,500 feet from the drift mouth.

Section E (sample 319) was cut from the face of left heading 4, off dip entry 4, 3,500 feet from the drift mouth.

A composite sample was made by mixing the face samples 318, 319, 320, 321, and 322 for an ultimate analysis, the results of which are shown under laboratory No. 10459.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed, and was shot down with black powder or with a permissible explosive. The tipple was equipped with lump screens of the bar type with spaces 1¼ to 3 inches, but at the time of sampling most of the coal was shipped in run-of-mine form. Three trimmers picked the coal as it was loaded on the cars. The mine in April, 1910, at time of sampling, had a daily capacity of 1,200 tons and an output of 1,000 tons, estimated entirely from advance workings. It was expected that the output would be increased to 1,500 tons per day in the near future. The coal was used for steaming and domestic purposes, but some of it was also used for making coke. It is classed as a smokeless coal. The larger part of the product was shipped to the seaboard.

For chemical analyses of this coal see part I of this bulletin, p. 163; also U. S. Geol. Survey Bull. 316, p. 24.

VINTONDALE. VINTON NO. 6 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10254, 10255, 10256, 10257, 10271 (p. 163).

Mine.—Vinton No. 6; Central Pennsylvania district; a drift mine, at Vintondale, on the Cresson Division of the Pennsylvania Railroad, and on the Buffalo, Rochester & Pittsburgh Railway.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3 feet 6 inches, varying from 3 feet to 4 feet. The roof is a hard gray shale of good quality. The floor is a hard clay with smooth surface.

The bed was measured and sampled at four points by A. J. Hazlewood on April 15, 1910, as described below:

Sections of coal bed in Vinton No. 6 mine, at Vintondale.

Section	A		B		C		D	
Laboratory No.	10257		10254		10256		10255	
Roof, hard gray slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	½	0	4½	0	8	0	10
Sulphur (local lens)	0	¼	0	⅛	..	..	..	..
Coal	1	1	0	4	..	..	..	..
Coal (hard gray)	..	..	0	3	0	4	0	3
Coal	..	..	0	10½	0	4	0	9
Coal (very fragile)	1	6	1	6⅝	1	3½	1	4
Coal	..	..	..	..	0	10½	0	6
Floor, hard clay.								
Thickness of bed	3	7¾	3	4¾	3	6	3	8
Thickness of coal sampled	3	7¾	3	4¾	3	6	3	8

Section A (sample 10257) was cut from the face of room 15 off left entry.

Section B (sample 10254) was cut from the face of right entry 6.

Section C (sample 10256) was cut from the face of the main heading.

Section D (sample 10255) was cut from the face of right entry 5.

A composite sample was made by mixing the face samples 10254, 10255, 10256, and 10257, for an ultimate analysis, the results of which are shown under laboratory number 10271.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed, and was shot down with a permissible explosive. The tipple was equipped with stationary bar screens with spaces varying from 1¼ to 3 inches. One-third of the output was shipped in run-of-mine form and the other two-thirds was screened. The screenings were washed and coked. The mine in April, 1910, at time of sampling, had a capacity of 1,000 tons and an average daily output of 750 tons, which was mostly derived from workings. It was expected that the output would be increased in the near future to 1,000 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 163.

WALSALL. INGLESIDE MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3839, (p. 163).

Mine.—Ingleside; Central Pennsylvania district; north of Walsall, on Stony Creek near Johnstown.

Coal bed.—Lower Kittanning, Miller, or B. Carboniferous age, Allegheny formation. Thickness, about 7 feet 4 inches. Roof, shale or sandstone; floor, clay.

The bed was measured and sampled in 1906 by W. C. Phalen. The sample represented 3 feet 7 inches of clear coal.

Note.—Output in 1910, 22,346 tons.

For chemical analyses of this coal see part I of this bulletin, p. 163; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WEBER STATION. COMMERCIAL NO. 4 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3831 (p. 163).

Mine.—Commercial No. 4; Central Pennsylvania district; on the south fork of Black Lick Creek, at Weber Station.

Coal bed.—Lower Kittanning, Miller, or B. Carboniferous age, Allegheny formation. Roof, shale; floor, clay.

The bed was measured and sampled on September 17, 1906, by W. C. Phalen, as shown below:

Section of coal bed in No. 4 mine at Weber.

Laboratory No.	3831	
Roof, shale.	*Ft.*	*in.*
Coal	3	7
Parting[a]	0	2
Coal[a]	0	6
Parting[a]	0	6
Coal	0	7
Floor, clay.		
Thickness of bed	5	6
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken from heading 8.

Note.—Output in 1910, 129,604 tons.

For chemical analyses of this coal see part I of this bulletin, p. 163; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WINDBER. EUREKA NO. 37 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 3835, 8975, 8976, 8977, 8978, 8979, 8980, 9028 (p. 164).

Mine.—Eureka No. 37; a drift mine in the Central Pennsylvania district, 2 miles northwest of Windber on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation; thickness, fairly uniform, ranging as mined from 3 feet 6 inches to 5 feet; roof, gray, coarse, sandy shale 30 feet thick and capped with sandstone; floor, hard clay with smooth surface; cover, for the most part, 130 to 300 feet.

The bed was measured and sampled at six points by R. Y. Williams on August 25 and 26, 1909, as described below:

Sections of coal bed in Eureka No. 37 mine, 2 miles west of Windber.

Section	A		B		C		D		E		F	
Laboratory No	8975		8976		8977		8978		8979		8980	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9	0	8½	0	8	0	5½	1	½	0	4
Bony coal [a]	..	..	..	..	..	..	0	1	..	..	..	..
Coal (gray)	0	½	0	½	..	..	..	..	..	..	..	..
Coal (hard dull)	..	..	..	..	0	½	..	..	..	..	0	½
Coal	1	3½	..	..	2	10¾	0	2	..	..	2	0
Coal (mother coal streaks)	..	..	1	10	..	..	..	..	..	..	..	..
Pyrites [a]	0	¼	0	½	..	..	0	1	0	1½	..	..
Coal	0	9	0	8½	..	..	0	8½	0	6½	..	..
Pyrites [a]	0	⅛	..	..	..	..	0	⅝	..	..	..	..
Bony coal and sulphur [a]	..	..	..	..	..	..	..	..	0	½	0	½
Coal	0	10¼	..	..	..	..	1	1	0	11½	0	11¾
Pyrites [a]	..	..	..	..	..	..	0	¾	0	¼	..	..
Coal	..	..	..	..	..	..	0	9	1	1	..	..
Pyrites [a]	..	..	..	..	..	..	..	..	0	½	..	..
Coal	..	..	..	..	..	..	..	..	0	10¼	..	..
Floor, hard clay.												
Thickness of bed	3	8⅝	3	4	3	7¼	3	5⅜	4	8½	3	4¾
Thickness of coal sampled	3	8¼	3	3½	3	7¼	3	2	4	5¾	3	4¼

[a] Not included in sample.

Section A (sample 8975) was cut from the face of the main air course, 8,300 feet from the drift mouth.

Section B (sample 8976) was cut from the last entry stump of right entry 18, off the main entry, 7,400 feet from the drift mouth.

Section C (sample 8977) was cut from the last entry stump of left entry 16, off the main entry, 6,300 feet from the drift mouth.

Section D (sample 8978) was cut from the face of the north entry, 9,500 feet from the drift mouth.

Section E (sample 8979) was cut from left entry 2, off the northwest drift, 4,500 feet from the drift mouth.

Section F (sample 8980) was cut from the face of north main entry 2, 9,000 feet from the drift mouth.

A composite sample was made by mixing the face samples 8975, 8978, 8979, and 8980 for an ultimate analysis, the results of which are shown under laboratory number 9028.

The bed was also measured on August 24, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Eureka No. 37 mine, near Windber.

Laboratory No	3835	
Roof, sandy shale.	*Ft*	*in.*
Coal	3	6
Shale (variable) [a]	1	0
Coal (variable) [a]	0	10
Floor, clay.		
Thickness of bed (variable)	5	4
Thickness of coal sampled	3	6

[a] Not included in sample.

Notes.—The coal at this mine was undercut in the bottom part of the seam by air-puncher machines, and was shot down with black blasting powder. The tipple was not equipped with screens, so that the entire output was shipped in run-of-mine form. This is a coking coal, but there were no ovens at this plant. The coal was picked on the car by two trimmers. The coal from the Eureka No. 37–C′ mine was loaded with the coal from this mine, the combined daily output at time of sampling averaging 2,000 tons; 2,800 tons was the maximum day's run. The future production was to be derived from advance work and from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 164; also Bull. 316, p. 25.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WINDBER. EUREKA NO. 40 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8913, 8914, 8915, 8916, 8917, 8918, 8919, 9031, 9032 (pp. 164, 165).

Mine.—Eureka No. 40; a drift mine in the Central Pennsylvania district, at Scalp Level, near Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The coal at this mine averages 4 feet in thickness, varying from 3 to 4½ feet. It has a hard gray shale roof with smooth surface, but in places a bony coal about 4 inches in thickness is left up for a roof. The floor is a shaly clay with a smooth surface.

The bed was measured and sampled at seven points by H. M. Wolflin on August 24 and 25, 1909, as described below:

Sections of coal bed in Eureka No. 40 mine, near Windber.

Section	A		B		C		D		E		F		G	
Laboratory No	8919		8917		8915		8914		8916		8913		8918	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	..	..	[a] 0	1½	[a] 0	3½	[a] 0	5	[a] 0	4	[a] 0	5	..	..
Bony coal	[a] 0	2½	..	..	..	..	..	..	..	..	..	..	..	..
Coal	[a] 0	1½	0	8	0	8	0	10	1	2	0	6¾	..	..
Coal (hard)	[a] 0	7	0	3	0	3	0	1	1	0	..	..	0	5
Pyrites	..	..	..	..	..	..	..	..	..	..	0	¼	..	..
Coal (dull)	..	..	2	11	1	2½	0	11¾	1	8½	..	..	..	..
Coal	0	3	..	..	..	..	..	..	..	..	..	..	0	6
Coal (gray)	1	3½	..	..	1	8½	..	..	..	..	0	10½	0	11½
Pyrites	..	..	..	..	..	..	0	¼	..	..	..	..	..	..
Coal	..	..	..	..	..	..	2	1	..	..	0	8	1	10½
Mother coal	..	..	..	..	..	..	..	..	..	..	0	½	..	..
Coal	1	7½	..	..	..	..	..	..	..	..	1	8	..	..
Floor; shaly underclay.														
Thickness of bed	4	1	3	11½	4	1½	4	5	4	2½	4	3	3	9
Thickness of coal sampled	3	2	3	10	3	10	4	0	3	10½	3	10	3	9

[a] Not included in sample.

Section A (sample 8919) was cut from pillar 6 on right entry 1, off right entry 3, off main entry, 1,600 feet north northeast of the drift mouth.

Section B (sample 8917) was cut from pillar 20 on right entry 6, off the main entry, 3,000 feet N. 25° E. of the drift mouth.

Section C (sample 8915) was cut from the face of left entry 6, off right entry 6, off the main entry, 4,500 feet northeast of the drift mouth.

Section D (sample 8914) was cut from the face of left entry 3, off right entry 7, off the main entry, 4,900 feet N. 25° E. of the drift mouth.

Section E (sample 8916) was cut from the face of the main air course, 200 feet from left entry 16, 6,100 feet N. 15° E. of the drift mouth.

Section F (sample 8913) was cut from the face of left entry 12, off the main entry, 4,600 feet north of the drift mouth.

Section G (sample 8918) was cut from pillar 20 on left entry 9, off the main entry, 3,500 feet N. 8° W. of the drift mouth.

Composite samples were made by mixing the face samples 8913, 8914, 8915, and 8916, and by mixing the pillar samples 8917, 8918, and 8919 for ultimate analyses, the results of which are shown under laboratory numbers 9031 and 9032, respectively.

Notes.—The coal at this time was undercut with puncher machines and was shot down with black blasting powder. There were no screens, the entire output being loaded as run-of-mine coal. The coal was picked by three trimmers as it was loaded on the cars. The capacity of the mine was 4,000 tons a day, the average daily output being 1,780 tons. The maximum day's run was 4,850 tons. The mine had 2,450 acres of solid coal to work out. The immediate future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 165.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WINDBER. EUREKA NO. 37–C′ MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8981, 8982, 8983, 9029 (p. 165).

Mine.—Eureka No. 37–C′, a drift mine in the Central Pennsylvania district, 2 miles west of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Upper Kittanning, or C′ of the State Survey reports. Carboniferous age, Allegheny formation. Thickness, fairly uniform, ranging as mined from 3 feet 6 inches to 5 feet; roof of gray, coarse, sandy shale, 30 feet thick and capped with sandstone; floor, hard clay with smooth surface. Cover, for the most part, from 50 to 220 feet.

The bed was measured and sampled at three points by R. Y. Williams on August 26, 1909, as described below:

Sections of coal bed in Eureka No. 37–C′ mine, 2 miles west of Windber.

Section	A		B		C	
Laboratory No.	8981		8982		8983	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal (tough)	[a] 0	5	[a] 0	10	[a] 0	1
Pyrites	[a] 0	¼	..	..	..	..
Coal	..	..	1	6	1	3½
Coal (mother-coal streaks)	1	2	..	..	..	..
Mother coal and sulphur	..	..	[a] 0	2	..	..
Bony coal	0	½	..	..	[a] 0	2
Coal	0	5	..	..	0	5½
Coal (hard, gray)	0	5	0	6	0	3
Coal	2	4¾	0	11	2	½
Coal (hard)	..	..	1	0	..	..
Floor, hard clay.						
Thickness of bed	4	10½	4	11	4	3½
Thickness of coal sampled	4	5¼	3	11	4	½

[a] Not included in sample.

Section A (sample 8981) was cut from the face of the main entry, 3,900 feet from the drift mouth.

Section B (sample 8982) was cut from the face of right entry 7, 3,500 feet from the drift mouth.

Section C (sample 8983) was cut from the face of entry 4, off right entry 4, 3,260 feet from the drift mouth.

A composite sample was made by mixing the face samples 8981, 8982, and 8983 for an ultimate analysis, the results of which are shown under laboratory number 9029.

Notes.—The coal at this mine was undercut in the bottom part of the bed by air-puncher machines, and was shot down with black blasting powder. The tipple was not equipped with screens, so that the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at the plant. The coal was picked on the car by two trimmers. The coal from Eureka No. 37 mine was loaded with the coal from this mine, the combined daily output averaging 2,000 tons, and 2,800 tons was the maximum day's run. The future production was to be derived from advance work and from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 165.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WINDBER. EUREKA NO. 42 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6271, 6272, 6273, 8999, 9000, 9001, 9002, 9051 (p. 165).

Mine.—Eureka No. 42; Central Pennsylvania district, a drift mine 4½ miles east of Windber, on the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, B, or Miller. Carboniferous age, Allegheny formation. The bed is about 5 feet thick. The roof is sandstone and the floor is clay.

The bed was measured and sampled on July 22, 1908, by K. M. Way, at three points as described below:

Sections of bed in Eureka No. 42 mine, 4½ miles east of Windber.

Laboratory No.	6271		6272		6273	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone.						
Coal [a]	0	2	..	..	..	..
Bone [a]	..	..	0	4	0	2½
Shale	..	..	..	..	..	..
Coal	3	4	3	3	0	9
Bone [a]	..	..	..	..	0	1½
Shale [a]	0	8	0	8	..	..
Coal	0	8	0	8	2	9
Shale [a]	..	..	..	..	0	9
Coal [a]	..	..	..	..	0	6½
Floor, fire clay.						
Thickness of bed	4	10	4	11	5	1½
Thickness of coal sampled	3	4	3	[illegible]	3	6

[a] Not included in sample.

Sample 6271 was taken 700 feet north of opening in face of main heading C.

Sample 6272 was taken 1,000 feet north of opening, in room 9 of right entry 1 off main entry.

Sample 6273 was taken 600 feet west of opening in face of left entry 1 off main entry.

Notes.—New mine. Output at time of sampling not stated.

The bed was also measured and sampled at four points by H. M. Wolflin on August 31, 1909, as described below:

Sections of coal bed in Eureka No. 42 mine, 4½ miles east of Windber.

Section	A		B		C		D	
Laboratory No.	8999		9000		9001		9002	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.								
Top coal [a]	0	4	..	..	..	..	0	2
Coal	2	4	0	3	..	..	0	7½
Coal (hard gray)	..	..	0	8	0	8	0	8
Bony coal	..	..	..	..	0	1	..	..
Coal	..	..	1	10½	2	9½	2	1½
Floor, hard clay.								
Thickness of bed	2	8	2	9½	3	6½	3	7
Thickness of coal sampled	2	4	2	9½	3	6½	3	5

[a] Not included in sample.

Section A (sample 8999) was cut from the face of the main entry.

Section B (sample 9000) was cut from the face of right entry 2, off the main entry.

Section C (sample 9001) was cut from the face of right entry 1, off the main entry, near left entry 6.

Section D (sample 9002) was cut from the face of right entry 3 off left entry 1 off the main entry.

A composite sample was made by mixing the face samples 8999, 9000, 9001, and 9002 for an ultimate analysis, the results of which are shown under laboratory number 9051.

Notes.—The coal at this mine was undercut by chain or puncher machines in the bottom part of the bed, and was shot down with black blasting powder. At time of sampling in 1909, there were no screens, the coal being loaded in run-of-mine form. This mine had loaded 2,200 tons in one day, but the average daily output was 503 tons. This mine could load about 1,800 tons daily. The future output was to be almost entirely from advance work. There were 720 acres of coal to be taken out by this mine.

For chemical analyses of this coal see part I of this bulletin, p. 165.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WINDBER. EUREKA NO. 42–C′ MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 9003 (p. 165).

Mine.—Eureka No. 42–C′; a drift mine in the Central Pennsylvania district, 4½ miles from Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Upper Kittanning, or C′ of the State Survey reports. Carboniferous age, Allegheny formation. The coal varies in thickness from 4½ to 5½ feet; has a hard shale roof and a shaly underclay floor. The floor is a good one from which to shovel the coal and did not get mixed with the coal.

The bed was measured and sampled at one point by H. M. Wolflin on August 31, 1909, as described below:

Sections of coal bed in Eureka No. 42–C′ mine, 4½ miles from Windber.

Laboratory No.	9003	
	Ft.	*in.*
Roof, hard shale.		
Coal (hard bright)	0	11½
Mother coal	0	¼
Coal	0	6½
Bony coal	0	6
Coal	2	3½
Floor, hard clay.		
Thickness of bed	4	3¾
Thickness of coal sampled	4	3¾

Section A (sample 9003) was cut from the face of right entry 2, off the main entry, 1,000 feet north and 55 degrees east from the drift mouth.

Notes.—About 20 tons per day was mined at this place from the C′ bed. The coal was loaded at the tipple of Eureka No. 42 mine and was included in the output of that mine.

For chemical analyses of this coal see part I of this bulletin, p. 165.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

CENTER COUNTY.

Osceola Mills. No. 10 Mine.

Sample.—Semibituminous coal; Windber field; analysis No. 8481 (p. 165).

Mine.—No. 10; Central Pennsylvania district; at Osceola Mills, on the New York Central and the Pennsylvania railroads.

Coal bed.—Lower Kittanning or B. Carboniferous age; Allegheny formation.

The bed was measured and sampled on July 2, 1909, by G. H. Ashley, as shown below:

Section of coal bed in No. 10 mine at Osceola Mills.

Laboratory No	8481	
	Ft.	*in.*
Coal	0	11
Bone[a]	0	8
Coal	2	8
Thickness of bed	4	3
Thickness of coal sampled	3	7

[a] Excluded from sample.

The sample was obtained in room 20, off main dip heading, 8,000 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, page 165.

CLARION COUNTY.

Blue Ball Station. Goss Mine.

Sample.—Semibituminous coal; Clarion field; analysis No. 8487 (p. 165).

Mine.—Goss; Central Pennsylvania district; at Blue Ball station.

Coal bed.—Brookville or A. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 30, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Goss mine, at Blue Ball station.

Laboratory No	8487	
	Ft.	*in.*
Roof, shale.		
Coal (average)[a]	0	2
Shale (average)[a]	0	3
Coal	1	1
Shale[a]	0	1
Coal	2	4
Bone[a]	0	6
Floor, sandy clay.		
Thickness of bed	4	5
Thickness of coal sampled	3	5

[a] Not included in sample.

The sample was taken in a room off the main heading, 500 feet in the mine.

For chemical analyses of this coal see part I of this bulletin, p. 166.

Clarion. Cook Prospect.

Sample.—Bituminous coal; Clarion field; analysis No. 4173 (p. 166).

Location.—Cook prospect; Pittsburgh district; 1½ miles northwest of Clarion. No railroad connection.

Coal bed.—Clarion, known locally as the "Sulphur vein." Carboniferous age, Allegheny formation. In the vicinity of Clarion this bed has an average thickness of about 3½ feet. Dip, slight, southwestward

The bed was measured and sampled on October 29, 1906, by E. F. Lines, as shown below:

Section of coal bed in Cook prospect, 1½ miles northwest of Clarion.

Laboratory No	4173	
Roof, sandstone.	*Ft.*	*in.*
Clay [a]	1	0
Coal	2	11½
Thickness of bed	3	11½
Thickness of coal sampled	2	11½

[a] Not included in sample.

The sample was obtained in the main entry, 100 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 165; also U. S. Geol. Survey Bull. 316, pp. 18, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, pp. 14, 18.

FAIRMOUNT CITY. NO. 1 MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 4170 (p. 166).

Mine.—No. 1; Pittsburgh district; 1½ miles northeast of Fairmount City, and 1 mile north of Oak Ridge, on branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation. This coal is the most important in this part of Clarion County. It is persistent, widely distributed, and has an average thickness of 3 feet. It contains no regular partings, and the irregular ones are thin.

The bed was measured and sampled on November 14, 1906, by E. F. Lines, as shown below:

Section of coal bed in No. 1 mine, 1½ miles northeast of Fairmount City.

Laboratory No	4170	
	Ft.	*in.*
Coal	0	7
Coal, bony [a]	0	½
Coal	1	9
Sulphur [a]	0	¾
Coal	0	11½
Thickness of bed	3	4¾
Thickness of coal sampled	3	3½

[a] Not included in sample.

The sample was taken in the mine, 200 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, pp. 17, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 15; Bull. 454, p. 25.

FAIRMOUNT CITY. FAIRMOUNT NO. 11 MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 4171 (p. 166).

Mine.—Fairmount No. 11, 2 miles northeast of Fairmount City, on branch of Pennsylvania Railroad.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation.

The bed was measured and sampled on November 14, 1906, by E. F. Lines, as shown on the following page.

Section of coal bed in Fairmount No. 11 mine, 2 miles northeast of Fairmount City.

Laboratory No	4171	
	Ft.	in.
Roof, clay.		
Coal	2	2½
Sulphur [a]	0	½
Coal	1	1
Sulphur [a]	0	½
Coal	0	10
Floor, clay.		
Thickness of bed	4	2½
Thickness of coal sampled	4	1½

[a] Excluded from sample.

The sample was obtained in the mine 100 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 454, p. 45.

For geologic relations see U. S. Geol. Survey Bull. 454, pp. 25–45.

NEW BETHLEHEM. SHENKEL'S COUNTRY BANK.

Sample.—Bituminous coal; Clarion field; analysis No. 4177 (p. 166).

Location.—Shenkel's country bank, 1 mile northwest of New Bethlehem. No railroad connection.

Coal bed.—Upper Kittanning. Carboniferous age, Allegheny formation.

The bed was measured and sampled on November 13, 1906, by E. F. Lines, as shown below:

Section of coal bed in Shenkel's country bank, 1 mile northwest of New Bethlehem.

Laboratory No	4177	
	Ft.	in.
Coal, bony [a]	0	6
Coal	1	1
Coal, bony [a]	0	½
Coal	1	11
Coal, bony [a]	0	6
Thickness of bed	4	½
Thickness of coal sampled	3	0

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 454, pp. 45.

For geologic relations see U. S. Geol. Survey Bull. 454, pp. 25–45.

NEW BETHLEHEM. FAIRMOUNT NO. 12 MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 4172 (p. 166).

Mine.—Fairmount No. 12; northeast of Fairmount City, and 3 miles northeast of New Bethlehem.

Coal bed.—Lower Freeport. The coal is of Carboniferous age, Allegheny formation.

The bed was measured and sampled on November 14, 1906, by E. F. Lines, as described below:

Section of coal bed in Fairmount No. 12 mine, 3 miles northeast of New Bethlehem.

Laboratory No	4172	
	Ft.	in.
Coal	2	2½
Sulphur [a]	0	½
Coal	1	1
Sulphur [a]	0	½
Coal	0	10
Thickness of coal bed	4	2½
Thickness of coal sampled	4	1½

[a] Not included in sample.

The sample was taken in the mine, 200 feet from the mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 166.

For geologic relations see U. S. Geol. Survey Bull. 316, pp. 21, 26, 30–31, 38; Bull. 454, p. 25.

RIMERSBURG. MOHNEY'S COUNTRY BANK.

Sample.—Bituminous coal; Clarion field; analysis No. 4176 (p. 166).

Location.—Mohney's country bank; 3½ miles northeast of Rimersburg and 4 miles southeast of Sligo. No railroad connection.

Coal bed.—Upper Kittanning. Carboniferous age, Allegheny formation.

The bed was measured and sampled on October 27, 1906, by E. F. Lines, as shown below:

Section of coal bed in Mohney's country bank, 3½ miles northeast of Rimersburg.

Laboratory No	4176	
Roof, shale.	*Ft.*	*in.*
Coal	1	11
Clay [a]	0	½
Coal	0	3½
Floor, clay.		
Thickness of bed	2	3
Thickness of coal sampled	2	2½

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, pp. 16, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 14; Bull. 454, p. 25.

RIMERSBURG. ACME MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 4055 (p. 166).

Mine.—Acme; 1 mile south of Rimersburg.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation.

The bed was measured and sampled on October 15, 1906, by E. F. Lines, as shown below:

Section of coal bed in Acme mine, 1 mile south of Rimersburg.

Laboratory No	4055	
	Ft.	*in.*
Coal	1	0
Binder [a]	0	½
Coal	2	7
Thickness of bed	3	7½
Thickness of coal sampled	3	7

[a] Excluded from sample.

The sample was taken 800 feet from the entrance of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, pp. 17, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 18; Bull. 454, p. 25.

SLIGO. SLIGO MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 3953 (p. 166).

Mine.—Sligo; ½ mile west of Sligo.

Coal bed.—Brookville. Carboniferous age, Allegheny formation.

The bed was measured and sampled on October 6, 1906, by E. F. Lines, as shown below:

Section of coal bed in Sligo mine, ½ mile west of Sligo.

Laboratory No	3953	
	Ft.	*in.*
Coal	1	9
Sulphur [a]	0	¾
Coal	0	7
Sulphur [a]	0	½
Coal	0	6
Thickness of bed	2	11¼
Thickness of coal sampled	2	10

[a] Not included in sample.

The sample was taken 200 feet in.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, p. 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 18; Bull 454, p. 25.

SLIGO. SHORB PIT.

Sample.—Bituminous coal; Western Pennsylvania field; analysis No. 3951 (p. 166).

Location.—Shorb pit; 0.8 mile north of Sligo.

Coal bed.—Lower Kittanning. The coal is of Carboniferous age, Allegheny formation.

The bed was measured and sampled by E. F. Lines on October 10, 1906. The sample was taken 350 feet in mine.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, p. 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 17; Bull. 454, p. 25.

SLIGO. SAYLOR COUNTRY BANK.

Sample.—Bituminous coal; Clarion field; analysis No. 4111 (p. 166).

Location.—Saylor country bank; 2¼ miles southeast of Sligo.

Coal bed.—Upper Freeport. The coal is of Carboniferous age, Allegheny formation.

The bed was measured and sampled by E. F. Lines on October 27, 1906, as described below:

Section of coal bed in Saylor country bank, 2¼ miles southeast of Sligo.

Laboratory No	4111	
	Ft.	*in.*
Coal, bony [a]	0	7
Coal	3	3
Thickness of bed	3	10
Thickness of coal sampled	3	3

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, pp. 15, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 15; Bull. 454, p. 25.

STRATTONVILLE. BALDAUF NO. 1 MINE.

Sample.—Bituminous coal; Clarion field; analysis No. 4116 (p. 166).

Mine—Baldauf No. 1; 2 miles southeast of Strattonville.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation.

The bed was measured and sampled in 1906 by E. F. Lines, as shown below:

Section of coal bed in Baldauf No. 1 mine, 2 miles southeast of Strattonville.

Laboratory No	4116	
	Ft.	*in.*
Roof, shale.		
Coal	0	4½
Binder [a]	0	2½
Coal	2	7½
Thickness of bed	3	2½
Thickness of coal sampled	3	0

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 166; also U. S. Geol. Survey Bull. 316, pp. 17, 19.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 15; Bull. 454, p. 25.

CLEARFIELD COUNTY.

GASSAM. GASSAM NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8483 (p. 166).

Mine.—Gassam No. 1; in the Central Pennsylvania district; located at Gassam.

Coal bed.—Lower Freeport or D. Carboniferous age, Allegheny formation.

The bed was measured and sampled on July 1, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Gassam No. 1 mine, at Gassam.

Laboratory No	8483	
	Ft.	*in.*
Bone [a]	0	2
Coal	3	0
Floor, clay.		
Thickness of bed	3	2
Thickness of coal sampled	3	0

[a] Not included in sample.

The sample was taken 8,000 feet in mine, off left entry 9.

For chemical analyses of this coal see part I of this bulletin, p. 167.

GRAHAM. GUION MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8484 (p. 167).

Mine.—Guion; Central Pennsylvania district; ½ mile northwest of Graham.

Coal bed.—Middle Kittanning or C. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 30, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Guion mine, ½ mile northwest of Graham.

Laboratory No	8484	
	Ft.	*in.*
Roof, shale.		
Coal [a]	0	10
Dark shale [a]	1	6
Coal	2	10
Thickness of bed	5	2
Thickness of coal sampled	2	10

[a] Not included in sample.

The sample was taken 6,000 feet in mine at the end of straight heading 4.

For chemical analyses of this coal see part I of this bulletin, p. 167.

GRAHAM. HARKLEY MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8485 (p. 167).

Mine.—Harkley; Central Pennsylvania district; ¼ mile northwest of Graham.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. Roof, shale; floor, clay, 5 inches over 2 inches of sandstone, under which is shale.

The bed was measured and sampled on June 30, 1909, by G. H. Ashley. The measurement showed 3 feet of coal.

The sample was taken 2,700 feet in mine in room at the end of the main heading, beyond entry 7.

For chemical analyses of this coal see part I of this bulletin, p. 167.

GRAMPIAN. GRAMPIAN NO. 3 MINE.

Sample.—Bituminous coal; Punxsutawney field; analysis No. 8482 (p. 167).

Mine.—Grampian No. 3; Central Pennsylvania district; ½ mile west of Grampian.

Coal bed.—Lower Freeport or D. Carboniferous age, Allegheny formation. Roof, shale; floor, clay.

The bed was measured and sampled on July 1, 1909, by G. H. Ashley. The sample represented 4 feet of coal.

The sample was taken 500 feet in the mine, off the main heading.

For chemical analyses of this coal see part I of this bulletin, page 167.

LA JOSE. CLEARFIELD NO. 1 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 5227, 5233 (p. 167).

Mine.—Clearfield No. 1; Central Pennsylvania district; a drift mine 1½ miles west of La Jose and 4½ miles northwest of Burnside, on the Pennsylvania Railroad.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation. The bed is about 3 feet thick with a blue shale roof and a clay floor.

The bed was measured and sampled on July 5, 1907, by K. M. Way, as shown below:

Sections of bed in Clearfield No. 1 mine, 1½ miles west of La Jose.

Laboratory Nos	5227		5233	
Roof, blue shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	2¼	..	..
Bony coal [a]	..	..	0	1
Hard shale [a]	0	1½	..	..
Mother coal	..	..	0	¼
Coal	0	5¾	0	2¼
Mother coal	..	..	0	¼
Coal	..	..	0	11½
Mother coal	..	..	0	⅜
Coal	..	..	0	5½
Shale [a]	..	..	0	½
Coal	..	..	0	7¼
Floor, fire clay.				
Thickness of bed	2	9½	2	4⅞
Thickness of coal sampled	2	8	2	3⅜

[a] Not included in sample.

Sample 5227 was taken 1,700 feet southwest of the opening in the face of heading 5.

Sample 5233 was taken 1,700 feet west of the opening in room 5 off heading 7.

Note.—The estimated daily output of mine was 200 tons at the time of sampling.

For chemical analyses of this coal see part I of this bulletin, page 167.

MADERA. SYLVANIA NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8490 (p. 167).

Mine.—Sylvania No. 1; Central Pennsylvania district; east of Madera.

Coal bed.—Brookville or A (?). Carboniferous age, Allegheny formation.

The bed was measured and sampled on July 2, 1909, by George H. Ashley, as shown below:

Section of coal bed in Sylvania No. 1 mine, east of Madera.

Laboratory No	8490	
	Ft.	*in.*
Roof, sandstone.		
Bony coal	0	10
Shale	0	1
Coal	1	6
Shale	..	..
Coal	3	6
Floor, sandstone.		
Thickness of bed	5	11
Thickness of coal sampled	5	11

The sample was taken 5,000 feet in mine in right entry 1.

For chemical analyses of this coal see part I of this bulletin, p. 167.

MOSHANNON. LOCAL MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8488 (p. 167).

Mine.—A small mine; Central Pennsylvania district, ½ mile north of Moshannon.

Coal bed.—Lower Freeport, Moshannon, or D. Carboniferous age, Allegheny formation.

The bed was sampled on July 2, 1909, by G. H. Ashley, the sample representing 5 feet of coal.

The sample was taken at the top level of the D bed, 500 feet in, close to big fault. It was taken from pillars left in the old No. 1 Moshannon mine. The coal averaged 5 feet in thickness; it had a gray shale roof and a clay floor.

For chemical analyses of this coal see part I of this bulletin, p. 167.

OSCEOLA MILLS. UNION NO. 3 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8480 (p. 167).

Mine.—Union No. 3; Central Pennsylvania district; ¼ mile southeast of Osceola Mills.

Coal bed.—Brookville or A. Carboniferous age, Allegheny formation.

The bed was measured and sampled on July 3, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Union No. 3 mine, ¼ mile southeast of Osceola Mills.

Laboratory No	8480	
	Ft.	*in.*
Bony coal [a]	0	7
Coal [a]	0	12
Binder [a]	0	1
Coal	1	7
Binder [a]	0	1½
Coal	2	3
Floor, clay, very hard and sandy.		
Thickness of bed	5	7½
Thickness of coal sampled	3	10

[a] Not included in sample.

The sample was taken 1,000 feet from the mine mouth in left entry 2, off the main entry.

For chemical analyses of this coal see part I of this bulletin, p. 167.

PHILIPSBURG. ACME NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 10258, 10259, 10260, 10261, 10264, and 10265 (p. 165).

Mine.—Acme No. 2, a slope mine in the Central Pennsylvania district, 3½ miles southeast of Philipsburg, on the Clearfield branch of the New York Central Railroad.

Coal bed.—Lower Kittanning, also known in this field as the Miller, or B. Carboniferous age, Allegheny formation. The bed at the mine has an average thickness of 4 feet 3 inches, varying from 3 feet 6 inches to 4 feet 6 inches. It has a bony coal parting 6 to 9 inches thick, left up in the rooms but taken down in the roadways. The roof is a strong shale. The floor is a hard clay with smooth surface.

The bed was measured and sampled at four points by G. S. Rice on April 16, 1910, as described below:

Sections of coal bed in Acme No. 2 mine, 3½ miles southwest of Philipsburg.

Section	A		B		C		D	
Laboratory Nos	10258		10259		10260		10261	
Roof, strong, blocky slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (top coal, blocky)	0	9	[a] 0	9	[a] 0	6	[a] 0	6
Bony coal and shale	[a] 0	9	[a] 0	9	[a] 0	8	[a] 0	6
Coal (prismatic structure, soft)	3	1	1	3	1	1	1	5
Coal (grayish luster)	..	..	..	..	0	5	..	..
Sulphur lens	..	..	[a] 0	2	..	..	..	..
Double parting of shale	..	..	..	..	..	..	[a] 0	1
Coal (soft, with several thin streaks of sulphur)	..	..	1	2	1	7	0	9
Coal (hard, blocky)	..	..	0	2	..	..	0	2
Coal (soft)	..	..	0	3	..	..	0	2
Floor, hard clay.								
Thickness of bed	4	7	4	6	4	3	3	7
Thickness of coal sampled	3	10	2	10	3	1	2	6

[a] Not included in sample.

Section A (sample 10258) was cut from the face of left heading 3, off Hawk Run entry, ½ mile southwest of the entrance, where the cover was about 50 feet thick.

Section B (sample 10259) was cut from the face of the last room off left entry, off Hawk Run entry, about ⅜ mile southwest of the entrance, where the cover was about 50 feet thick.

Section C (sample 10260) was cut from a pillar in room 1 of Packer heading, about ¾ mile northeast of the entrance, where the cover was about 100 feet thick.

Section D (sample 10261) was cut from a pillar in room 1, off left entry 3, off Lucky 2½ entry, about ¾ mile northeast of the entrance, where the cover was about 100 feet thick.

A composite sample was made of the face samples 10258 and 10259. The results of an ultimate analysis of this sample are shown under laboratory No. 10264.

A composite sample was also made of the pillar samples 10260 and 10261. The results of an ultimate analysis of this sample are shown under laboratory No. 10265.

Notes.—The coal at this mine was undercut, and was shot down with black powder. The mine had an output of 300 to 350 tons per day when running. It had a mechanical capacity of 500 to 600 tons. It was much troubled by water draining in from the surface. The coal within the former boundaries was nearly worked out, but the operating company stated that it had leased 158 acres adjacent to the slope.

For chemical analyses of this coal see part I of this bulletin, p. 165.

SMOKERUN. EUREKA No. 22 MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 8489 (p. 167).

Mine.—Eureka No. 22; Central Pennsylvania district; ½ mile west of Smokerun.

Coal bed.—Lower Freeport or D "lower split." Carboniferous age, Allegheny formation.

The bed was measured and sampled on July 2, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Eureka No. 22 mine, ½ mile west of Smokerun.

Laboratory No	8489	
	Ft.	*in.*
Roof, shale.		
Bony coal	0	2
Coal	2	6
Floor, clay.		
Thickness of bed	2	8
Thickness of coal sampled	2	8

The sample was taken from a pillar 2,600 feet in the mine in west entry 1 off the main heading.

For chemical analyses of this coal see part I of this bulletin, p. 167.

WOODLAND. PLANE MINE.

Sample.—Bituminous coal; Punxsutawney field; analysis No. 8486 (p. 167).

Mine.—Plane; Central Pennsylvania district; ½ mile southwest of Woodland.

Coal bed.—Upper Kittanning, or C′. Carboniferous age, Allegheny formation.

The bed was measured and sampled on August 1, 1909, by G. H. Ashley, as shown below:

Section of coal bed in Plane mine, ½ mile southwest of Woodland.

Laboratory No	8486	
	Ft.	*in.*
Roof, shale.		
Coal	3	9
Bone	0	7
Coal	3	3
Floor, clay.		
Thickness of bed	7	7
Thickness of coal sampled	3	0

The output of this mine in 1910 was 15,505 tons.

The sample was taken in right entry 1, off right heading 1.

For chemical analyses of this coal see part I of this bulletin, p. 167.

FAYETTE COUNTY.

CONNELLSVILLE. LEISENRING No. 1 MINE.

Sample.—Bituminous (coking) coal; Pittsburgh field; analyses Nos. 4411 and 4412 (Penna. No. 21) and analyses Nos. 5236 and 7594 (p. 168).

Mine.—Leisenring No. 1; Connellsville district; a shaft mine in the Connellsville district, 2 miles southwest of Connellsville, on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. At this mine the bed lies nearly flat and has an average thickness of 7 feet 6½ inches. The cover is over 300 feet. The roof is a top coal, 1 foot thick, above which is shale. The floor is a hard shale; in places bottom coal 6 inches thick is left for a floor.

The bed was measured and sampled at two points in the mine by J. W. Groves, D. E. Winchester, R. T. Carroll, and A. K. Adams on January 5, 1907, as shown below:

Sections of coal bed in Leisenring No. 1 mine, 2 miles southwest of Connellsville.

Section	A		B	
Laboratory No	4412		4411	
Roof, top coal.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal [a]	1	0	0	7
Coal	4	10	3	2
Shale	0	¼	..	..
Hard coal	..	..	0	1½
Coal	0	2½	1	7½
Shale	0	⅛	..	..
Mother coal	..	..	0	¼
Coal	2	7	0	4½
Shale	..	..	0	¼
Coal	..	..	0	3
Shale [a]	..	..	0	½
Coal	..	..	1	10
Floor, sec. A, shale; sec. B, coal.				
Thickness of bed	8	7⅞	8	½
Thickness of coal sampled	7	7⅞	7	5

[a] Not included in sample.

Section A (sample 4412) was measured in the main butt entry, 9,000 feet northwest of the shaft.

Section B (sample 4411) was measured in left flat entry 6, 6,500 feet northwest of the shaft.

The bed was also measured and sampled on June 21, 1907, and June 26, 1908, by K. M. Way, as shown below:

Sections of coal in bed of Leisenring No. 1 mine, 2 miles southwest of Connellsville.

Section			A		B		C			
Laboratory No	5236								7594	
Roof, top coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	11	1	9½	1	10½	2	2	0	7½
Shale, mother coal	0	¼	0	½	..	..	..	..	0	¾
Coal	..	..	..	..	..	..	..	..	2	0
Sulphur	..	..	..	..	0	⅜	..	..	..	..
Mother coal	..	..	..	..	..	..	..	..	0	1/16
Shale	..	..	..	..	..	..	0	¼	..	..
Coal	1	11	0	10¼	2	3½	0	9	0	1¾
Slate	..	..	..	..	..	..	..	..	[a] 0	¾
Shale and mother coal	0	¼	..	..	..	..	..	..	..	..
Coal	..	..	..	..	..	..	..	..	1	3½
Bony coal	..	..	0	½	..	..	..	..	..	..
Shale	..	..	..	..	0	½	0	½	..	..
Slate	..	..	..	..	..	..	..	..	0	⅛
Coal	1	0	2	1¼	0	2½	0	7	0	1¾
Mother coal	..	..	..	..	..	..	..	..	0	⅛
Shale	0	½	..	..	..	..	..	..	..	..
Coal	..	..	..	..	..	..	..	..	0	2
Mother coal	..	..	0	¼	..	..	..	..	..	..
Slate	..	..	..	..	..	..	..	..	0	1/16
Shale	..	..	..	..	0	½	..	..	..	..
Coal	..	..	..	..	..	..	..	..	0	6 5/16
Bone	..	..	..	..	..	..	0	1¼	..	..
Slate	..	..	..	..	..	..	..	..	0	1/16
Coal	0	3½	0	1½	2	11½	1	10	0	2¾
Shale	0	½	..	..	..	..	0	¼	..	..
Slate	..	..	..	..	..	..	..	..	[a] 0	1
Mother coal	..	..	0	¼	..	..	..	..	..	..
Coal	2	11½	0	8	..	..	0	2	0	4
Mother coal	..	..	0	¼	..	..	0	¼	0	½
Coal	..	..	0	2½	..	..	1	11	0	2
Mother coal	..	..	..	..	..	..	..	..	0	¼
Coal	..	..	..	..	..	..	..	..	1	1¾
Floor, hard shale.										
Thickness of bed	8	2½	5	10¾	7	5⅜	7	7½	7	1
Thickness of coal sampled	8	2½	5	10¾	7	5⅜	7	7½	6	11¼

[a] Not included in sample.

Sample 5326 was taken 7,500 feet north of opening, in butt parallel entry 2, north side of right entry 6.

Sample A was taken 9,100 feet north of opening, in right aircourse 7, from chain pillar at bottom of butt entry 7, below right entry 7.

Sample B was taken 10,000 feet north of opening, off butt entry 7, off right entry 8.

Sample C was taken 6,500 feet north of opening, in 6th left section, from chain pillar in bottom of butt entry 1.

Sample 7594 was taken 2½ miles south of south opening, in butt entry 6, off rib 7.

Notes.—This mine is situated in the heart of the Connellsville region, and the coal, like that from most of the mines in the district, was used in the manufacture of coke. The average output of the mine at the time of sampling in 1906 was approximately 1,400 tons per day, all of which was shipped in run-of-mine form to coke ovens near the mine.

For results of tests of this coal see mention of specific tests as follows: Coking tests, U. S. Geol. Survey Bull. 332, p. 220; Bull. 336, pp. 24, 32, 33, 41, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75.

For chemical analyses see part I of this bulletin, p. 168; also U. S. Geol. Survey Bull. 332, p. 219.

EAST MILLSBORO. HUSTEAD MINE.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 6) analyses Nos. 1968, 1970 (p. 168).

Mine.—Hustead; a slope mine at East Millsboro, on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Its thickness is fairly uniform, at this mine being 6 to 8 feet. The bed lies nearly flat. The roof is coal. The floor is clay. The bed carries occasional irregular thin bands of "sulphur" and shale.

The bed was measured and sampled at two points by J. W. Groves on August 9, 1905, as shown below:

Section of coal bed in Hustead mine at East Millsboro.

Section	A		B	
Laboratory No.	1968		1970	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Clay [a]	1	0	1	2
Black shale [a]	..	..	0	2
Coal	6	8	3	6
Shale	..	..	0	¾
Coal	..	..	0	1½
Shale	..	..	0	1¼
Coal	..	..	0	8
Sulphur	..	..	0	⅛
Coal	..	..	2	4
Floor, clay.				
Thickness of bed	7	8	8	1⅝
Thickness of coal sampled	6	8	6	9⅝

[a] Not included in sample.

Section A (sample 1968) was measured in butt entry 5, 900 feet from the bottom of the slope.

Section B (sample 1970) was measured in butt entry 1, 1,300 feet north of the bottom of the slope.

Notes.—The mine when inspected in 1905 had been opened about a year, and was not producing heavily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 172; Bureau of Mines Bull. 23, pp. 67, 176; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 173; Bureau of Mines Bull. 13, pp. 184, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 174; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 175; Bull. 336, pp. 24, 31, 40, 41; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63,

For chemical analyses see part I of this bulletin, p. 183; also U. S. Geol. Survey Bull. 290, p. 172.

GREENE COUNTY.

DURBIN. CRABAPPLE MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1585 (p. 168).

Mine.—Crabapple; at Durbin.

Coal bed.—Waynesburg. Carboniferous age, Monongahela formation. Thickness at this mine, 5 feet 9 inches.

The bed was measured and sampled by W. T. Griswold on October 11, 1904, the sample representing 3 feet of coal.

For chemical analyses of this coal see part I of this bulletin, p. 168.

For other mention of this sample see U. S. Geol. Survey Prof. Paper 48, pp. 112, 113.

RYERSON STATION. COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1239 (p. 168).

Location.—Country bank; 1 mile north of Ryerson station.

Coal bed.—Washington. Carboniferous age, Washington formation.

The bed was measured and sampled on October 11, 1904, by F. G. Clapp and F. W. De Wolf, as shown below:

Section of coal bed in country bank 1 mile north of Ryerson station.

Laboratory No	1239	
Roof, clay.	*Ft.*	*in.*
Coal	0	5
Clay[a]	0	1½
Coal	0	2
Clay[a]	1	0
Coal	0	3
Clay[a]	0	5
Coal	1	11
Floor, clay.		
Thickness of bed	4	3½
Thickness of coal sampled	2	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 168; also U. S. Geol. Survey Prof. Paper 48, p. 273; Bull. 300, p. 115.

For geologic relations see U. S. Geol. Survey Bull. 300, p. 112.

HUNTINGDON COUNTY.

JACOBS. BARNETT MINE.

Sample.—Semibituminous coal; Broad Top field; analysis No. 10319 (p. 168).

Mine.—Barnett; a drift mine, at Jacobs, Todd Township, on a branch (3½ miles long) of the East Broad Top Railroad (narrow gage).

Coal bed.—Known in this field as the Barnett, and is the equivalent of the Lower Kittanning or B bed. Carboniferous age, Allegheny formation. The bed is a double bed separated by a hard sandy shale parting said to be 2 to 6 feet thick; the upper bench, said to be from 2 to 3 feet thick, is not mined at this mine, but the lower bench is mined and averages about 3 feet 2 inches in thickness and varies from 3 feet to 3 feet 6 inches. It dips to the east about 8°. The roof is of hard and strong sandy shale. The floor is a soft bedded clay with smooth surface.

The bed was measured and sampled at one point by G. S. Rice on April 18, 1910, as described below:

Section of lower bench of coal bed in Barnett mine, at Jacobs.

Laboratory No	10319
Roof, hard sandy shale.	*Ft.* *in.*
Shale and coal (sometimes good coal)[a]	0 3
Coal (black, bright, tough, frequent thin streaks of mother coal)	1 2
Coal (soft, clean, prismatic structure)	1 9½
Floor, soft, bedded clay shale, smooth, hard surface.	
Thickness of bed	3 2½
Thickness of coal sampled	2 11½

[a] Not included in sample.

Section A (sample 10319) was cut from the face of level heading, about 600 feet from the entrance of the mine, where the cover is about 90 feet thick.

Notes.—The coal at this mine was mined by pick, in places in the middle and in places in the bottom of the bed. It was shot down with black powder. It was loaded on cars as run-of-mine coal, and had a considerable proportion of small coal, but there were also many large irregular chunks. It is a bright clean-appearing coal. When sampled the mine was relatively new. There was only one pair of entries. The output in April, 1910, was from 50 to 80 tons per day, and could not be materially increased without increasing outside equipment or transferring the work from the Jacobs mine (Fulton bed). The coal was expected to come from advance work for some years.

For chemical analyses of this coal see part I of this bulletin, p. 168.

JACOBS. JACOBS MINE.

Sample.—Semibituminous coal; Broad Top field; analyses Nos. 10315, 10316, 10317, 10333 (p. 169).

Mine.—Jacobs; Broad Top district; a drift mine at Jacobs, Todd Township, on a branch (3½ miles long) of the East Broad Top Railroad (narrow gage).

Coal bed.—Known in this field as the Fulton. Carboniferous age, Allegheny formation. Average thickness, 4 feet 2½ inches, varying from 3 feet 9 inches to 9 feet. Where mined it dips to the east from 5° to 10°. The main roof is a sandstone, usually underlain with a strong black shale, varying from a knife edge to a number of feet thick. In some places, between this and the coal, there is a "draw slate" from less than 1 inch to 12 inches thick, which when present may become mixed with the coal. The floor is a hard clay with smooth surface.

The bed was measured and sampled at three points by G. S. Rice on April 18, 1910, as described below:

Sections of coal bed in Jacobs mine, at Jacobs.

Section	A		B		C	
Laboratory No	10315		10316		10317	
Roof, draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (tough, some fine shale streaks)	0	3	0	1½	0	1½
Shale or sulphur	..	..	0	¼	0	⅛
Coal (soft slabby)	1	7	0	11½	0	9½
Bone	0	½	..	..	..	..
Sulphur	..	..	0	¼	0	⅛
Coal (soft slabby)	..	..	0	7	0	9
Coal (grayish, hard)	..	..	0	½	0	3
Coal (prismatic structure)	2	8	2	1	1	10¼
Coal (shaly)	0	1½	..	..	..	..
Coal (good)	0	4	..	..	..	..
Floor, hard clay.						
Thickness of bed	5	0	3	10	3	9½
Thickness of coal sampled	5	0	3	10	3	9½

Section A (sample 10315) was cut from the face of the last room off the dip air course about 1,000 feet from the entrance of the mine, where the cover was about 120 feet thick.

Section B (sample 10316) was cut from the face of level heading, about 3,300 feet from the entrance of the mine, where the cover was about 200 feet thick.

Section C (sample 10317) was cut from the face of room 31 off level heading, 2,800 feet from the entrance of the mine, where the cover was about 150 feet thick.

A composite sample was made by mixing the face samples 10315, 10316, and 10317. The results of an ultimate analysis of this sample are shown under laboratory number 10333.

Notes.—At the time of sampling, the coal at this mine was mined by pick, in some places in the middle and in some places in the bottom of the bed, and was shot down with small charges of black powder. The coal was hauled to the same tipple on which the coal from the Barnet bed mine was dumped. The two coals were said not to be mixed in the railroad car unless by request, being dumped separately. The tipple was not provided with screens, the coal being loaded in run-of-mine form. There appeared to be considerable small coal on the cars, but also many large irregular chunks. The reported daily output in April, 1910, from the Fulton bed was 200 to 225 tons. The output was to be derived from advance work for several years as the pillars in the old work were not to be pulled on account of the Barnett bed 44 feet above.

For chemical analyses of this coal see part I of this bulletin, p. 169.

JACOBS. STARR MINE.

Sample.—Semibituminous coal; Broad Top field; analysis No. 10318 (p. 169).

Mine.—Starr; a drift mine in the East Broad Top district, Todd Township, 3½ miles south of Jacobs, on the main line of the East Broad Top Railroad (narrow gage).

Coal bed.—Known in this field as the Fulton. Carboniferous age, Allegheny formation. The bed at this mine has an average thickness of 5 feet, varying from 4¾ to 5¼ feet. The roof is a black shale, about 4 feet thick, with smooth surface, although the coal sticks slightly to the top. A hard clay forms the floor. It is smooth and the coal parts readily from it.

The bed was measured and sampled by G. S. Rice on April 18, 1910, as described below·

Section of coal bed in Starr mine, 3½ miles south of Jacobs.

Laboratory No.	10318	
Roof, shale, black, gnarly.	*Ft.*	*in.*
Coal (top coal, good quality, sticks to roof) [a]	0	3
Coal	0	7
Shaly bone coal [a]	0	2½
Coal, black, bright, prismatic structure, contains ⅛-inch parting of shale 1½ inches above floor	4	½
Floor, hard clay.		
Thickness of bed	5	1
Thickness of coal sampled	4	7½

[a] Not included in sample.

Section A (sample 10318) was cut from the west rib near the face of the right heading, about 150 feet from the entrance of the mine where the cover is about 40 feet.

Notes.—The coal at this mine at the time of sampling was usually mined in the top coal by pick, and shot up by lifting holes, with black powder. There were no screens at the tipple; the coal was loaded in run-of-mine form. This was a new mine and only a few narrow-gage railroad cars had been loaded. No rooms had yet been turned.

For chemical analyses of this coal see part I of this bulletin, p. 169.

INDIANA COUNTY.

CLYMER. RODKEY MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 7969, 7971 (p. 169).

Mine.—Rodkey; Central Pennsylvania district; 1 mile from Clymer.

Coal bed.—Lower Kittanning. Carboniferous age, Allegheny formation.

The bed was measured and sampled on June 15, 1909, by Charles Butts, as shown below:

Section of coal bed in the Rodkey mine, 1 mile from Clymer.

Laboratory No.	7969		7971	
	Ft.	*in.*	*Ft.*	*in.*
Roof, black shale.				
Bony coal [a]	0	2	0	2
Coal	3	½	3	1½
Floor, clay.				
Thickness of bed	3	2½	3	3½
Thickness of coal sampled	3	½	3	1½

[a] Not included in sample.

Sample 7969 was taken at face of left entry 4, 1,400 feet from the pit mouth.

Sample 7971 was taken in the main entry.

For chemical analyses of this coal see part I of this bulletin, p. 169.

CLYMER. PENN-MARY NO. 1 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 7972, 7973 (p. 169).

Mine.—Penn-Mary No. 1; Central Pennsylvania district; 1 mile from Clymer.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation.

Section of coal bed in Penn-Mary No. 1 mine, 1 mile from Clymer.

Laboratory No.	7972		7973	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	[a] 0	1¾	[a] 0	3
Shale	[a] 0	7	[a] 1	6
Coal	3	2	1	5
Shale	[a] 0	1½	[a] 0	1
Coal (in places 5 in.)	[a] 0	½	1	10
Floor, clay.				
Thickness of bed	4	¾	5	1
Thickness of coal sampled	3	2	3	3

[a] Not included in sample.

Sample 7972 was taken in right heading 3, off town drift.

Sample 7973 was taken off right heading 1.

For chemical analyses of this coal see part I of this bulletin, p. 169.

GLEN CAMPBELL. GLENWOOD NO. 9 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 5224, 5228 (p. 169).

Mine.—Glenwood No. 9; Central Pennsylvania district; a drift mine at Glen Campbell, Banks Township, on the Pennsylvania Railroad.

Coal bed.—Upper Kittanning or C′. Carboniferous age, Allegheny formation. Thickness, about 4½ feet; roof, shale; floor, bastard fire clay.

The bed was measured and sampled on July 2, 1907, by K. M. Way at two points as described below:

Sections of bed in Glenwood No. 9 mine at Glen Campbell.

Laboratory No.	5224 Ft.	5224 in.	5228 Ft.	5228 in.
Roof, shale.				
Bony coal [a]	0	3¾	0	3¾
Coal	0	5¾	0	9
Bony coal [a]	0	3½	0	4
Coal	1	8½	1	8¾
Cannel coal	0	1½	0	1½
Coal	1	4½	1	7
Floor, clay.				
Thickness of bed	4	3½	4	10
Thickness of coal sampled	3	8¼	3	2¼

[a] Not included in sample.

Sample 5224 was taken 2,600 feet northwest of the opening in the face of right cross heading 1.

Sample 5228 was taken 2,900 feet northwest of the opening in room 37 off right entry 2.

Notes.—At the time of sampling the coal was under-cut with chain machines. The estimated daily output was 285 tons.

For chemical analyses of this coal see part I of this bulletin, p. 169.

GLEN CAMPBELL. INDIANA NO. 2 MINE.

Sample.—Bituminous coal; Punxsutawney field; analysis No. 5222 (p. 169).

Mine.—Indiana No. 2; Central Pennsylvania district; a drift mine 2 miles northeast of Glen Campbell (Horton Run), on the Pennsylvania Railroad.

Coal bed.—Lower Freeport or D. Carboniferous age, Allegheny formation. The bed is 3 feet thick at point sampled; has a blue shale roof and a clay floor.

The bed was measured and sampled on July 3, 1907, by K. M. Way, as described below:

Section of bed in Indiana No. 2 mine, 2 miles northeast of Glen Campbell.

Laboratory No.	5222 Ft.	5222 in.
Roof, blue shale.		
Bony coal [a]	0	5¼
Coal	0	6½
Bone and shale	0	½
Coal	1	11½
Floor, clay.		
Thickness of bed	2	11¾
Thickness of coal sampled	2	6½

[a] Not included in sample.

The sample was taken 1,000 feet north of the opening in right heading 2.

Note.—Though this mine was not being operated at time of sampling, 100 tons was given as the daily output.

For chemical analyses of this coal see part I of this bulletin, p. 169.

GLEN CAMPBELL. INDIANA NO. 3 MINE.

Sample.—Bituminous coal; central Pennsylvania field; analyses Nos. 5225, 5229 (p. 169).

Mine.—Indiana No. 3; Central Pennsylvania district; a drift mine 2 miles from Glen Campbell (Horton Run), on the Pennsylvania Railroad.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation. The bed is about 4 feet 3 inches thick, has a shale roof and a clay floor.

The bed was measured and sampled at two points on July 3, 1907, by K. M. Way, as described below:

Sections of coal bed in Indiana No. 3 mine, 2 miles from Glen Campbell.

Laboratory No.	5229		5225	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bony coal[a]	0	2¾	0	3¼
Coal	0	11½	3	3¾
Shale[a]	0	⅜	0	1½
Coal	2	3¾	0	6
Hard shale[a]	0	1½	..	..
Shale	..	..	0	½
Coal	0	7	..	..
Floor, fire clay.				
Thickness of bed	4	2⅞	4	3
Thickness of coal sampled	3	10¼	3	10¼

[a] Not included in sample.

Sample 5229 was taken from a point 3,000 feet west of the opening in the back heading, off the straight heading.

Sample 5225 was taken 3,000 feet west of the opening in right heading 10.

Note.—The daily output of the mine was 200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 169.

HOMER CITY. LUCERNE NO. 1 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 10306, 10307, 10308, 10309, 10310, 10311, 10312, 10313 (pp. 169, 170).

Mine.—Lucerne No. 1; Central Pennsylvania district; a drift mine 1 mile east of Homer City, on the Indiana Branch of the Buffalo, Rochester & Pittsburgh Railway.

Coal bed.—Upper Freeport, known in this field as the E. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 6 feet and varies from 5 feet 8 inches to 6 feet 9 inches. The roof is a hard shale of good quality, and is overlain with a sandstone. The floor is a hard shale with smooth surface.

The bed was measured and sampled at seven points by A. J. Hazlewood on April 19, 1910, as described below:

Sections of coal bed in Lucerne No. 1 mine, 1 mile east of Homer City.

Section	A		B		C		D		E		F		G	
Laboratory No.	10306		10307		10308		10309		10310		10311		10312	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard slate.														
Coal (upper bench)	1	9	1	9	2	0	1	9	1	9½	1	8	1	3½
Bone parting[a]	1	1	0	8	0	11	1	0	0	10	0	9	0	11½
Coal (lower bench)	3	5	3	11	3	8	3	10	3	2	3	7	3	4½
Floor, hard, smooth slate.														
Thickness of bed	6	3	6	4	6	7	6	7	5	9½	6	0	5	7½
Thickness of coal sampled	5	2	5	8	5	8	5	7	4	11½	5	3	4	8

[a] Not included in sample.

Section A (sample 10306) was cut from the face of right entry 3, 3,000 feet east of the drift mouth.

Section B (sample 10307) was cut from the face of right entry 7, 2,500 feet northeast of the drift mouth.

Section C (sample 10308) was cut from the face of right entry 11, 3,500 feet northeast of the drift mouth.

Section D (sample 10309) was cut from the face of the main back heading, 3,500 feet northeast of the drift mouth.

Section E (sample 10310) was cut from the face of left entry 5, 3,200 feet north of the drift mouth.

Section F (sample 10311) was cut from the face of left entry 3, 3,000 feet northwest of the drift mouth.

Section G (sample 10312) was cut from the face of right heading 7, off left entry 1, 3,000 feet northwest of the drift mouth.

A composite sample was made by mixing the face samples 10306, 10307, 10308, 10309, 10310, 10311, and 10312. The results of an ultimate analysis of this sample are shown under laboratory No. 10313.

Notes.—In 1910 the coal at this mine was undercut in the bottom part of bed by puncher machines, and was shot down by permissible explosives. Almost the entire output was screened over bar and revolving screens with 1¾ to 1⅛ inch openings. The lump coal was picked on belt by 14 men. Three trimmers also picked the coal as it was loaded on the cars. The mine in April, 1910, had a capacity of 1,500 tons, and an average daily output of 1,200 tons, all of which was derived from advance workings. This was a comparatively new mine and a large increase of the output was planned.

For chemical analyses of this coal see part I of this bulletin, pp. 169, 170.

HOMER CITY. LUCERNE NO. 3 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 10303, 10304, 10305, 10314 (p. 170).

Mine.—Lucerne No. 3; Central Pennsylvania district; a shaft mine, 176 feet deep, located ½ mile east of Homer City, on the Indiana Branch of the Buffalo, Rochester & Pittsburgh Railway.

Coal bed.—Upper Freeport, known in this field as the E. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 6 feet, varying from 5 feet 8 inches to 6 feet 9 inches. The roof is a hard shale of good quality, and is overlain with a sandstone. The floor is a smooth bony shale underlain with a clay.

The bed was measured and sampled at three points by A. J. Hazlewood on April 18, 1910, as described below:

Sections of coal bed in Lucerne No. 3 mine, ½ mile east of Homer City.

Section	A		B		C	
Laboratory No	10303		10305		10304	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, slate.						
Coal (upper bench)	..	..	0	9	1	4
Bone parting [a]	0	4	1	1	1	0
Coal (lower bench)	3	8	4	2	3	5½
Floor, bony slate.						
Thickness of bed	4	0	6	0	5	9½
Thickness of coal sampled	3	8	4	11	4	9½

[a] Not included in sample.

Section A (sample 10303) was cut from the face of the main north heading, 700 feet from the shaft bottom.

Section B (sample 10305) was cut from the face of west heading 1, off the main south entry, 600 feet from the shaft bottom.

Section C (sample 10304) was cut from the face of left heading 4, off south entry 3, 800 feet from the shaft bottom.

A composite sample was made by mixing the face samples 10303, 10304, and 10305. The results of an ultimate analysis are shown under laboratory number 10314.

Notes.—In 1910 the coal at this mine was undercut in bottom part of bed by puncher machines, and was shot down with a permissible explosive. This was a new mine, still in the development stage, and the outside equipment had not been completed. The tipple was to be equipped with bar and revolving screens; a coal washery was to be installed. In April, 1910, the output was shipped as run-of-mine coal. Three trimmers picked the coal as it was loaded on the cars. The average daily output at that time was 300 tons, all of which was derived from advance workings. It was planned within a year to increase the output to 2.000 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 170.

ROSSITER. CLEARFIELD NO. 3 MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 5226, 5223 (p. 171).

Mine.—Clearfield No. 3; Central Pennsylvania district; a drift mine, at Rossiter, Canoe Township, on the New York Central Railroad and the Buffalo, Rochester & Pittsburgh Railway.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation. The bed is about 4 feet 10 inches thick at points sampled; has a shale roof and a clay floor.

The bed was measured and sampled at two points on June 27, 1907, by K. M. Way, as described below:

Section of coal bed in Clearfield No. 3 mine, at Rossiter.

Laboratory No.	5226		5223	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bony coal [a]	0	9	0	9
Coal	3	9	1	½
Shale [a]	0	4	..	..
Mother coal	..	..	0	¼
Coal	..	..	0	10
Shale	..	..	0	⅜
Coal	..	..	1	7
Shale	..	..	0	4
Floor, fire clay.				
Thickness of bed	4	10	4	7⅛
Thickness of coal sampled	3	9	3	10⅛

[a] Not included in sample.

Sample 5226 was taken 7,900 feet southwest of the opening in the face of heading 12.

Sample 5223 was taken 5,100 feet southwest of the opening in room 45, off heading 8.

Note.—The estimated daily output at time of sampling was 3,000 tons.

For chemical analyses of this coal see part I of this bulletin, p. 171.

WEHRUM. LACKAWANNA NO. 4 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 4026 and 4027 (Penna. No. 15), and analysis No. 3774 (p. 171).

Mine.—Lackawanna No. 4; a shaft and slope mine in the Central Pennsylvania district, at Wehrum, on the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, locally known as the Miller or B. Carboniferous age, Allegheny formation. The thickness at this mine averages 3 feet 10 inches. The cover is about 190 feet. The roof is a gray shale. The floor is clay; below the clay is a layer of bony coal, 1 foot thick. The bed lies nearly flat, dipping to the west (?).

The bed was measured and sampled at two points in the mine by J. W. Groves on October 23, 1906, as shown below:

Sections of coal bed in No. 4 mine, at Wehrum.

Section	A		B	
Laboratory No.	4026		4027	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	1½	0	1¼
Sulphur [a]	0	⅛	0	¼
Coal	4	1	0	3½
Sulphur [a]	..	...	0	½
Coal	..	...	3	½
Floor, clay.				
Thickness of bed	4	2⅝	3	6
Thickness of coal sampled	4	2½	3	5¼

[a] Not included in sample.

Section A (sample 4026) was measured in north left heading 3, 2,000 feet northeast of the shaft.

Section B (sample 4027) was measured 1,900 feet southwest of the shaft.

The bed was also measured and sampled in 1906 by W. C. Phalen. The sample (No. 3774) was taken at a point where the bed was 4 feet 4 inches thick, 2,600 feet in the mine. The sample represented the whole thickness of the bed.

Notes.—The output of this mine had been used for steam production and for making coke. The coal is rather friable. A large washing plant had been erected at the mine with the intention of crushing and washing all the coal produced. The approximate capacity of the mine in 1906 was about 1,000 tons per day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 202; Bureau of Mines Bull. 23, pp. 67, 178; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 202; Bureau of Mines Bull. 13, pp. 195, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 204; washing tests: U. S. Geol. Survey Bull. 332, p. 202; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 203; Bull. 336, pp. 24, 32, 41.

For chemical analyses see part I of this bulletin, p. 171; also U. S. Geol. Survey Bull. 332, p. 201.

For geologic relations see U. S. Geol. Survey Bull. 447, pp. 16–27.

WHITE. MOOWEEN MINE.

Sample.—Bituminous coal; Punxsutawney field; (Pennsylvania No. 17) analyses Nos. 4336, 4337 (p. 171).

Mine.—Mooween; a drift mine in the Central Pennsylvania district, at White, on the Pennsylvania Railroad.

Coal bed.—Upper Freeport, or E of the Pennsylvania Geological Survey. It lies nearly flat. It is of Carboniferous age, Allegheny formation. Its thickness at this mine averages 3 feet 3 inches. The roof is good, being a hard gray shale. The floor is also good, being a gray shale like the roof. The bed contains a regular parting of shale or bony coal, about a foot from the bottom.

The bed was measured and sampled at two points in the mine by J. W. Groves and A. K. Adams on December 17, 1906, as shown below:

Sections of coal bed in Mooween mine, at White.

Section	A		B	
Laboratory No	4336		4337	
	Ft.	*in.*	*Ft.*	*in.*
Roof, hard gray shale.				
Coal	0	8	1	10
Mother coal	0	⅛	..	...
Shale[a]	..	..	0	¾
Coal	1	1	0	4½
Shale[a]	0	1	..	..
Bony coal[a]	..	..	0	1
Coal	0	4	0	11
Bony coal[a]	0	4	..	..
Coal	0	9	..	..
Floor, hard gray shale.				
Thickness of bed	3	3⅛	3	3¼
Thickness of coal sampled	2	10⅛	3	1½

[a] Not included in sample.

Section A (sample 4336) was measured in the main entry, 700 feet southwest of the drift mouth.

Section B (sample 4337) was measured in right entry 1, 485 feet west of the drift mouth.

Note.—The output of this mine was about 200 tons per day, all of which was shipped in run-of-mine form.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 208; Bureau of Mines Bull. 23, pp. 67, 178; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 208; Bureau of Mines Bull. 13, pp. 195, 275; washing tests: U. S. Geol. Survey Bull. 332, p. 209; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 209; Bull. 336, pp. 24, 32, 41.

For chemical analyses see part I of this bulletin, p. 171; also U. S. Geol. Survey Bull. 332, p. 207.

JEFFERSON COUNTY.

PUNXSUTAWNEY. ADRIAN MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 5219, 5221 (p. 171).

Mine.—Adrian; Central Pennsylvania district; a drift mine at De Lancey in Young Township, 3 miles north of Punxsutawney on the Buffalo, Rochester & Pittsburgh Railroad.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation. The bed is about 5 feet 9 inches thick at points sampled. The roof and floor are shale.

The bed was measured and sampled at two points on June 29, 1907, by K. M. Way, as described below:

Sections of coal bed in Adrian mine at De Lancey.

Laboratory No.	5221		5219	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bony coal[a]	0	8	0	8
Coal	2	4	3	8
Shale and mother coal	0	½	0	½
Coal	2	7½	1	5
Shale[a]	0	1½	..	..
Floor, shale.				
Thickness of bed	5	9½	5	9½
Thickness coal sampled	5	0	5	1½

[a] Not included in sample.

Sample 5221 was taken 6,800 feet east of opening, in room 11, off right heading 12.

Sample 5219 was taken 7,300 feet northeast of opening, in east entry 6, off left head entry 12.

Notes.—The Elk Run shaft and the Adrian mine were operated as one. The daily output was 2,000 tons.

For chemical analyses of this coal see part I of this bulletin, p. 171.

PUNXSUTAWNEY. FLORENCE MINE.

Sample.—Bituminous coal; Punxsutawney field; analyses Nos. 5231, 5232 (p. 171).

Mine.—Florence; Central Pennsylvania district; 4 miles north of Punxsutawney, on the Buffalo, Rochester & Pittsburgh Railroad.

Coal bed.—Lower Freeport. Carboniferous age, Allegheny formation. The bed is from 5 feet 10 inches to 6¾ feet thick at the points sampled; has a shale roof and clay floor.

The bed was measured and sampled on June 26, 1907, by K. M. Way, as described on the following page.

Sections of bed in Florence mine, 4 miles north of Punxsutawney.

Laboratory No.	5232		5231	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	7	0	2½
Hard coal	2	1¾	1	9½
Coal	1	3¾	1	11
Mother coal	0	¼	0	¼
Coal	0	7½	1	3
Mother coal	0	¼	..	..
Mother coal and shale	..	..	0	¼
Coal	1	4½	0	9
Mother coal	0	⅜	..	..
Coal	0	7	..	..
Floor, clay.				
Thickness of bed	6	8⅜	5	11½
Thickness of coal sampled	6	1⅜	5	9

[a] Not included in sample.

Sample 5232 was taken 1½ miles southeast of the opening in room 1, off butt entry 1, off left entry 9.

Sample 5231 was taken 1½ miles east of the opening, in room 1, off north entry 4, off left entry 8.

Note.—The estimated daily output at time of sampling was 3,800 tons.

For chemical analyses of this coal see part I of this bulletin, p. 171.

SCHUYLKILL COUNTY.

MINERSVILLE. PHOENIX PARK NO. 3 MINE.

Sample.—Anthracite coal; Southern field; analyses No. 5956 (p. 171).

Mine.—Phoenix Park No. 3; Pottsville district; a slope mine 830 feet deep, 2 miles west of Minersville, on the Reading Railway.

Coal bed.—Diamond; 650 feet above Mammoth bed. Carboniferous age, Monongahela (?) formation. The roof is soft shale, and the floor is slate. The bed was measured and sampled at one point by J. S. Burrows on February 19, 1908, as described below:

Section of coal bed in Phoenix Park No. 3 mine, 2 miles west of Minersville.

Laboratory No.	5956	
Roof, soft shale.	*Ft.*	*in.*
Draw slate [a]	0	3
Bone, hard, white streaks [a]	0	4
Coal, hard	0	5½
Slate, hard black [a]	0	3¼
Coal, hard	0	4
Shale, hard, black [a]	0	2
Coal, hard, bright	1	2½
Bone, white, scale [a]	0	¾
Coal, hard, bright	2	3
Bone [a]	0	½
Coal, hard, bright	2	3
Coal, soft, friable	0	3¼
Shale	0	¼
Coal, bony rough	0	5½
Floor, shale.		
Thickness of bed	8	4½
Thickness of coal sampled	7	3

[a] Not included in sample.

The sample was taken from level 6 in plane No. 2 of the east gangway, 1,300 feet east of the opening. It was very dry when taken.

For chemical analyses of this coal see part I of this bulletin, p. 171.

ST. NICHOLAS. ST. NICHOLAS (NO. 209) MINE.

Sample.—Anthracite coal; Southern field; analyses Nos. 5954, 5955 (p. 172).

Mine.—St. Nicholas (No. 209), a slope mine on the Philadelphia & Reading Railway at St. Nicholas.

Coal bed.—Mammoth (middle split). Carboniferous age, post-Pottsville beds. Coal is overlain with slate; has bony slate bottom; bed dips 55°.

The middle and bottom splits of this bed were measured and sampled on February 20, 1908, by J. S. Burrows as described below:

Sections of coal bed in St. Nicholas mine at St. Nicholas.

Laboratory No.	5955		5954	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bone, hard	[a]0	6	..	..
Coal, hard	0	9	3	10
Bone	[a]0	2	[a]0	2
Shale	..	..	[a]0	4
Coal, hard, two streaks of bone	2	4	..	..
Shaly coal	[a]1	3	..	..
Coal, hard	..	..	2	8
Coal, bright, laminated	2	9	..	..
Bone	..	..	[a]0	7
Slate, hard, black, sandy	[a]1	0	..	..
Coal	..	..	6	0
Shaly coal	1	8	..	..
Shale	[a]0	1	[a]0	1
Coal, laminated, friable	1	4	..	..
Coal, hard	..	..	0	10
Floor, shale.				
Thickness of middle split	11	10	14	6
Thickness of coal sampled	8	10	13	4

[a] Not included in sample.

Sample 5955 was taken at third lift, north dip, west middle split, 1,380 feet west of opening.

Sample 5954 was taken at third lift, north dip, west bottom split, 600 feet west of opening.

For chemical analyses of this coal see part I of this bulletin, p. 172.

TOWER CITY. WEST BROOKSIDE MINE.

Sample.—Anthracite coal; Southern field; analysis No. 5953 (p. 172).

Mine.—West Brookside; a slope mine, 1,040 feet long, 1 mile north of Tower City, on the Philadelphia & Reading Railway.

Coal bed.—Lykens (No. 5). Carboniferous age, Pottsville formation. The roof is quartz conglomerate; the floor is slate. Bed dips 48° to 0° to basin.

The bed was measured and sampled at one point by J. S. Burrows, on February 21, 1908, as described below:

Section of coal bed in West Brookside mine, 1 mile north of Tower.

Laboratory No.	5953	
	Ft.	*in.*
Roof, quartz conglomerate.		
Shaly coal	0	8
Shale, black [a]	0	3
Coal, hard	3	6
Parting	..	..
Coal, hard	4	0
Coal, soft, mining	1	0
Floor, shale.		
Thickness of bed	9	5
Thickness of coal sampled	9	2

[a] Not included in sample.

The sample was taken on the inside slope, 100 yards north of the main hoist, 300 feet north of the opening.

For chemical analyses of this coal see part I of this bulletin, p. 172.

SOMERSET COUNTY.

Boswell. Orenda No. 2 Mine.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6261, 6262, 6263 (p. 172).

Mine.—Orenda No. 2; Somerset County district; a slope mine at Boswell, on the Baltimore & Ohio Railway.

Coal bed.—Upper Kittanning, or C′. Carboniferous age, Allegheny formation. The coal as sampled ranged in thickness from 6 feet 1 inch to 6 feet 5 inches. The roof is sandy shale and the floor is hard shale.

The bed was measured and sampled at two points by J. S. Burrows and at one point by K. M. Way on July 14, 1908, as described below:

Section of coal beds in Orenda No. 2 mine, at Boswell.

Section	A		B		C	
Laboratory No	6261		6262		6263	
Roof, sandy shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	[a]1	3	[a]0	7½	[a]0	7½
Bone	[a]0	3½	[a]0	2¾	[a]0	2½
Coal	0	9	1	0	1	1
Bone	0	¾	0	¾	[a]0	½
Coal	4	2	4	2	0	1¾
Bone	..	..	..	..	[a]0	½
Coal	..	..	..	..	4	5
Floor, shale.						
Thickness of bed	6	6¼	6	1	6	6¾
Thickness of coal sampled	4	11¾	5	2¾	5	7¾

[a] Not included in sample.

Section A (sample 6261) was cut from the face of left flat heading 7, 3,400 feet north of the opening.

Section B (sample 6262) was cut from the face of right flat heading 8, 5,000 feet north of the opening.

Section C (sample 6263) was cut 500 feet from the face of right entry 7, 6,200 feet north of the opening.

Notes.—The average daily output at the time of inspection was 1,400 tons. The mine had a modern steel tipple and was equipped to handle 2,000 tons daily. All the coal was shipped in run-of-mine form. A good system of inspecting coal was maintained in the mines, and there were pickers in the car and the tipple.

For chemical analyses of this coal see part I of this bulletin, p. 172.

Elk Lick. Merchants No. 3 Mine.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6304, 6305 (p. 172).

Mine.—Merchants No. 3; in the Myersdale district; a drift mine 1½ miles northeast of Elk Lick, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh or Big Vein. Carboniferous age. Monongahela formation. The bed is 6½ feet and 6¾ feet thick at the points sampled. The roof and floor are of shale.

The bed was measured and sampled at two points on July 29, 1908, sample 6304 being taken by K. M. Way and sample 6305 by P. M. Riefkin. The sections follow:

Sections of coal bed in Merchants No. 3 mine, 1½ miles north of Elk Lick.

Laboratory No	6304		6305	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4	..	..
Bone	[a]0	10	[a]0	3
Coal	2	2	0	9¼
Bone	[a]0	2	[a]0	10¾
Coal	1	7	2	2¼
Bone	..	..	[a]0	3¾
Coal	[a]0	5	2	4
Floor, shale.				
Thickness of bed	6	6	6	9½
Thickness of coal sampled	5	1	5	4

[a] Not included in sample.

Sample 6304 was taken 3,300 feet northeast of the opening, in a face of right entry 1, off right heading 3.

Sample 6305 was taken 4,800 feet northeast of the opening, in a pillar in room 12 on right heading 5.

Notes.—A small quantity of solid coal was left. Future output was to be almost entirely from pillar coal. The output at time of sampling was about 700 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 172.

JENNER. JENNER NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6264, 6265, 6266 (p. 172).

Mine.—Jenner Mine No. 2; a drift mine at Jenner, on the Somerset Branch of the Baltimore & Ohio Railroad.

Coal bed.—Known in this field as the Upper Kittanning or C′. Carboniferous age, Allegheny formation. Its thickness at the points of sampling varied from 3 feet 9 inches to 4 feet.

The bed was measured and sampled at three points by P. M. Riefkin on July 18, 1908, as described below:

Sections of coal bed in Jenner No. 2 mine at Jenner.

Section	A		B		C	
Laboratory No	6264		6265		6266	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone	[a]0	1¼	[a]0	⅞	[a]0	¾
Coal	0	5	3	10⅜	1	4½
Sulphur	0	⅜	..	..	..	..
Shale	..	..	..	..	[a]0	⅜
Coal	3	3½	..	..	2	7⅜
Floor, shale.						
Thickness of bed	3	10⅛	3	11¼	4	1
Thickness of coal sampled	3	8⅞	3	10⅜	3	11⅞

[a] Not included in sample.

Section A (sample 6264) was cut from the face of heading 2, 5,400 feet southwest of the mine mouth.

Section B (sample 6265) was cut from the face of heading 1, 4,080 feet southwest of the mine mouth.

Section C (sample 6266) was cut from butt entry 2, off heading 10, 3,665 feet southwest of the mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 172.

JEROME. JEROME NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6258, 6259, 6260 (p. 173).

Mine.—Jerome No. 1; a shaft mine at Jerome, on the Cambria & Somerset Branch of the Baltimore & Ohio Railroad.

Coal bed.—C′, or Upper Kittanning. Carboniferous age, Allegheny formation. The coal bed at this mine ranges in thickness from 4 feet 11 inches to 5 feet 11 inches. The roof is a hard shale; the floor is of bony coal.

The bed was measured and sampled at three points by K. M. Way on July 16, 1908, as described below:

Sections of coal bed in Jerome No. 1 mine at Jerome.

Section	A		B		C	
Laboratory No	6258		6259		6260	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Bone and shale	[a] 0	4¼	[a] 0	4	[a] 0	4¼
Coal	0	11	0	10½	1	3
Bone	[a] 0	1	[a] 0	1	[a] 0	1
Coal	0	2½	[a] 0	1½	[a] 0	2
Bone	[a] 0	½	[a] 0	½	[a] 0	¼
Coal	1	3½	1	5	2	¾
Bone	0	¾	0	½	0	½
Coal	3	0	1	8	1	8¾
Bony coal	..	..	[a] 0	4¼	[a] 0	2½
Floor, bone.						
Thickness of bed	5	11½	4	11¼	5	11
Thickness of coal sampled	5	5¾	4	0	5	1

[a] Not included in sample.

Sample 6258 was cut at face of west entry 1, off main entry, about 4,700 feet west of the mine mouth.

Sample 6259 was cut in room 9, off south entry 6, off west entry 2, about 5,000 feet southwest of the mine mouth.

Sample 6260 was cut at face of east entry 2, about 3,900 feet southeast of the mine mouth.

Notes.—At the time of inspection this mine had a capacity of 1,850 tons a day and an average output of 1,200 tons. The tipple equipment was modern, and much care was exercised in preparing the coal for market.

For chemical analyses of this coal see part I of this bulletin, p. 173.

KIMMELTON. KIMMELTON MINE.

Sample.—Semibituminous coal; Windber field; (Pennsylvania No. 9) analyses Nos. 2016, 2017 (p. 173).

Mine.—Kimmelton; a drift mine at Kimmelton on the Baltimore & Ohio Railroad.

Coal bed.—Lower Kittanning, or B of the State reports. Carboniferous age, Allegheny formation. Thickness, fairly uniform, being not quite 3 feet at this mine; dip, irregular; roof, sandstone; floor, black laminated shale.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on August 17, 1905, as shown below:

Sections of coal bed in Kimmelton mine at Kimmelton.

Section	A		B	
Laboratory No	2016		2017	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Coal	0	5	0	4
Mother coal and shale	0	⅛	..	..
Mother coal	..	..	0	¼
Coal	2	6	2	6
Floor, shale.				
Thickness of bed	2	11⅛	2	10¼
Thickness of coal sampled	2	11⅛	2	10¼

Section A (sample 2016) was measured in butt entry 2, off right entry 6, 3,200 feet south of the drift mouth.

Section B (sample 2017) was measured in left entry 8, 3,000 feet southeast of the drift mouth.

Notes.—The coal from this mine, like that from other mines working the same bed in this district, is soft and friable. In 1905 it was all shipped in run-of-mine form for steam production. The estimated capacity of the mine in that year was 350 tons per day.

For results of tests of this coal, see mention of specific tests as follows—washing tests: U. S. Geol. Survey Bull. 290, p. 182; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 183; Bull. 336, pp. 24, 32, 41; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 173.

LISTIE. STAUFFER NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 305, 306, 307, 10455 (p. 173).

Mine.—Stauffer No. 1; a drift mine in the Somerset County district, one-quarter mile north of Listie, on the Somerset & Cambria Branch of the Baltimore & Ohio Railroad.

Coal bed.—Lower Freeport, or D of the State Survey reports. Carboniferous age, Allegheny formation. The thickness is uniform at this mine, averaging 3 feet 2 inches. The roof is a hard gray shale of good quality. A hard fire clay forms the floor, but usually a few inches of coal and shale are left as bottom.

The bed was measured and sampled at three points by P. M. Riefkin on April 15, 1910, as described below:

Sections of coal bed in Stauffer No. 1 mine, ¼ mile north of Listie.

Section	A		B		C	
Laboratory No	306		305		307	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, gray	[a] 0	2 5/8	[a] 0	2 3/4	[a] 0	2 3/4
Coal	2	1 1/8	0	8 1/2	0	7 3/16
Bone	[a] 0	3/4	0	3/8	0	1/16
Coal	0	6	0	6 3/4	0	4 3/4
Mother coal	..	..	0	1/16	..	..
Coal	..	..	1	3 3/8	1	6 5/16
Shale	[a] 0	1 1/4	[a] 0	1 1/4	[a] 0	1 1/2
Coal, soft	..	4 5/16	0	4 3/8	0	4 1/4
Floor, clay.						
Thickness of bed	3	4 1/16	3	3 7/16	3	2 11/16
Thickness of coal sampled	2	11 7/16	2	11 7/16	2	10 9/16

[a] Not included in sample.

Section A (sample 306) was cut from the face of room 5, off right heading 6, 2,625 feet northwest of the drift mouth.

Section B (sample 305) was cut from the face of room 4, off left heading 8, 2,860 feet northwest of the drift mouth.

Section C (sample 307) was cut from the face of room 25, off left heading 6, 2,950 feet northwest of the drift mouth.

A composite sample was made by mixing face samples 305, 306, and 307. The results of this sample are shown under laboratory number 10455.

Notes.—The coal at this mine was undercut with hand pick in the bottom part of the bed, and was shot down with black powder. There were no screens, the coal being loaded in run-of-mine form. The coal was picked by three trimmers as it was loaded on the car. The mine had loaded 650 tons in one day, but at the time of sampling in April, 1910, the actual average output was 425 tons, 50 per cent of which was derived from advance work.

For chemical analyses of this coal see part I of this bulletin p. 173.

MACDONALDTON. PEN MAR NO. 3 MINE.

Sample.—Semibituminous coal; Wehrum field; analyses Nos. 312, 313, 314, 315, 316, 317, 10454 (p. 173).

Mine.—Pen Mar No. 3; a drift mine in the Somerset County district, at Macdonaldton, on the Berlin Branch of the Baltimore & Ohio Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The bed at this mine has an average thickness of 4½ feet, varying from 4 feet 3 inches to 4 feet 2 inches. The roof is a hard gray shale with smooth surface. A hard clay forms the floor. The clay floor is smooth.
get mixed with the coal.

The bed was measured and sampled at six points by P. M. Riefkin on April 16, 1910, as described below:

Sections of coal bed in Pen Mar No. 3 mine at Macdonaldton.

Section	A		B		C		D		E		F	
Laboratory No.	312		313		314		315		316		317	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	[a] 0	5½	[a] 0	3¾	[a] 0	3	[a] 0	5¼	[a] 0	5⅜	[a] 0	4
Slate	0	1/16	0	1/16	0	2½	0	1/16	[a] 0	¼	[a] 0	⅜
Coal, hard	0	5	0	3⅝	0	3¼	0	6⅝	[a] 0	6⅜	[a] 0	4
Mother coal	..	..	..	..	0	1/16	..	..	..	..	0	⅛
Coal	..	..	0	3¼	0	2⅝	..	..	..	..	0	5⅛
Bony coal	[a] 0	1	[a] 0	1	[a] 0	2¼	[a] 0	1¼	[a] 0	1¾	[a] 0	1⅛
Coal	..	..	0	4 7/16	0	1	0	4⅝	..	..	0	7⅛
Mother coal	..	..	0	⅛	0	1/16	0	⅛	..	..	0	⅛
Coal	0	8¾	0	4 3/16	0	2⅝	0	4⅛	0	7⅝	0	5¼
Bony coal	0	1	[a] 0	1½	[a] 0	1/16	[a] 0	1⅜	..	..	[a] 0	½
Coal	..	..	0	2⅛	..	..	0	4⅞	..	..	0	9¼
Shale and sulphur	..	..	..	..	..	..	0	1	0	⅛	0	¼
Coal, bright	0	10⅞	0	6¼	0	3⅝	1	2⅝	0	11¼	0	5¼
Sulphur streak	0	1/16	0	¼	..	..	[a] 0	1/16	0	1/16	[a] 0	¾
Coal	0	5	0	2¾	0	1⅞	0	3¼	0	10⅝	0	5¾
Shale	..	..	0	1/16	0	1/16	[a] 0	⅛	0	1/16	0	⅛
Coal	..	..	1	1 3/16	2	0	0	4½	0	6¾	0	2¼
Shale	..	..	..	..	..	..	..	..	..	..	0	1/16
Coal, dirty, gray	0	2¾	0	4⅞	0	4½	0	2⅛	0	4	0	4
Floor, clay.												
Thickness of bed	3	4	4	3 7/16	4	3½	4	6	4	6¼	4	7 13/16
Thickness of coal sampled	2	9½	3	9 3/16	3	10 3/16	3	9 15/16	3	4½	3	9 1/16

[a] Not included in sample.

Section A (sample 312) was cut from face of south main heading 3, 6,500 feet southwest of drift mouth.

Section B (sample 313) was cut from face of right entry 13, off south main heading 3, 6,370 feet southwest of drift mouth.

Section C (sample 314) was cut from face of left entry 6, off south entry 3, 6,490 feet southeast of drift mouth.

Section D (sample 315) was cut from face of room 3, off right entry 9, off south main entry 3, 6,200 feet southwest of drift mouth.

Section E (sample 316), was cut near face of right entry 5, off south main heading 4, 6,700 feet southwest of drift mouth.

Section F (sample 317) was cut near face of right entry 2, off south main heading 3, 3,500 feet southwest of drift mouth.

A composite sample was made by mixing the face samples 312, 313, 314, 315, 316, and 317 for an ultimate analysis, the results of which are shown under laboratory number 10454.

Notes.—The coal at this time was undercut with air puncher machines in the bottom part of the bed, and was shot down with black powder. There were no screens, the coal being loaded in run-of-mine form. This mine had loaded 2,500 tons in one day, but at the time of inspection and sampling the actual average daily output was 1,100 tons. The greater part of the tonnage was derived from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 173.

MACDONALDTON. PEN MAR NO. 2 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 308, 309, 310, 311, 10451 (p. 174).

Mine.—Pen Mar No. 2; a shaft mine, 400 feet in depth, in the Somerset district, 1½ miles southwest of Macdonaldton, on the Berlin branch of the Baltimore & Ohio Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The bed at the mine has an average thickness of 4 feet 4 inches, varying from 4 feet to 4 feet 5 inches. The roof is a gray shale of good quality. A fairly hard shale forms the floor.

The bed was measured and sampled at four points by P. M. Riefkin on April 16, 1910, as described below:

Sections of coal bed in Pen Mar No. 2 mine, 1½ miles southwest of Macdonaldton.

Section	A		B		C		D	
Laboratory No.	308		309		310		311	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, slate.								
Bone	[a] 0	2	0	½	0	4¾	0	7
Shale	..	..	0	1/16	..	..	0	1/16
Bone	[a] 0	6	[a] 0	2½	0	1	0	5
Shale	0	1/16	[a] 0	¾	[a] 0	1	[a] 0	⅞
Coal	0	4¾	0	4⅜	0	7½	0	4
Bone and shale	[a] 0	⅞	0	½	0	½	[a] 0	1¾
Coal	0	5½	0	4	0	6 1/16	0	3
Bone and shale	[a] 0	1	0	1⅜	[a] 0	1½	[a] 0	4
Coal	0	3	0	3¼	0	3½	..	..
Shale	0	½	[a] 0	2½	0	3/16	..	..
Coal	0	3	0	10½	..	..	..	..
Sulphur streak	0	¼	0	⅛	..	..	..	..
Coal	0	9	0	8½	..	..	..	..
Mother coal	[a] 0	¼	0	1/16	..	..	..	..
Coal	1	1	0	5	1	7¾	1	10¾
Mother coal	0	1/16	0	1/16	0	1/16	0	1/16
Coal	..	..	0	5	..	..	..	..
Coal (gray, dirty)	0	3	0	3⅛	0	6½	0	4
Floor, shale.								
Thickness of bed	4	4¼	4	4 3/16	4	4 5/16	4	4½
Thickness of coal sampled	3	6⅛	3	10 7/16	4	1 13/16	3	9⅞

[a] Not included in sample.

Section A (sample 308) was cut from face of room 6, off level 1, between left entries 1 and 2, 2,000 feet west of drift mouth.

Section B (sample 309) was cut from face of left entry 3, off north main entry 2, 2,900 feet northwest of drift mouth.

Section C (sample 310) was cut in north main heading, 200 feet north of right heading 8, 3,000 feet north of drift mouth.

Section D (sample 311) was cut in neck of room 3, off right entry 1, off north main heading, 1,300 feet northeast of drift mouth.

A composite sample was made by mixing the face samples 308, 309, 310, and 311 for an ultimate analysis, the results of which are shown under laboratory number 10451.

Notes.—The coal at this mine was undercut with puncher machines in the bottom part of bed, and was shot down with permissible explosives and with black powder. There were no screens, the coal being loaded in run-of-mine form. Two trimmers picked the coal on the car as it was loaded. This mine had loaded 1,100 tons in one day, but the actual daily output was 800 tons. About 77 per cent of the coal was derived from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 174.

MEYERSDALE. ELK LICK NOS. 1, 2, AND 3 MINES.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6301, 6302, 6306, 6307 (p. 174).

Mine.—Elk Lick Nos. 1, 2, and 3 drift mines; Meyersdale district, 1½ miles southwest of Meyersdale, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh or Big Vein, except No. 3 mine (sample 6307), which is Redstone. Carboniferous age, Monongahela formation. The Pittsburgh bed is from 7¾ feet to 8 feet thick at the points sampled. The roof and the floor are shale. The dip is slight.

The bed was measured and sampled at four points, sample 6301 being taken by K. M. Way and sample 6306 by P. M. Riefkin on July 27, 1908, as described below:

Sections of coal bed in Elk Lick Nos. 1, 2, and 3 mines, 1½ miles southwest of Meyersdale.

Laboratory No.	6301		6306		6302		6307	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard shale	[a] 0	2¾	..	..	..	..	1	1
Sulphur	..	..	..	..	..	..	0	½
Coal	1	2	1	4¼	2	1½	..	..
Bone	[a] 1	2½	[a] 0	9¼	0	¼	..	..
Coal	2	2¾	0	10	0	6½	0	11
Bone	[a] 0	2	0	¾	[a] 0	1¾	0	1
Coal	0	7½	1	0	1	11	2	7
Shale	[a] 0	[b] 2¼	..	..	[a] 1	5	..	..
Bone	[a] 0	[b] 2¼	[a] 0	1	..	..	..	..
Coal	[a] 1	[b] 8¾	0	7½	0	5½	..	..
Bone	..	..	[a] 0	9½	0	½	..	..
Coal	..	..	0	4½	1	4¾	..	..
Shale	..	..	[a] 0	2¼	..	..	..	..
Bone	..	..	[a] 0	2¼	..	..	..	..
Coal	..	..	1	8¾	..	..	..	..
Floor, shale.								
Thickness of bed	7	8¾	8	0	8	¾	4	8½
Thickness of coal sampled	4	¼	5	11¾	6	6	4	8½

[a] Not included in sample. [b] Measurement estimated.

Sample 6301 was taken 3,000 feet northwest of opening in room 1, off butt entry 2, off right pump heading 2 of Elk Lick No. 1 mine.

Sample 6306 was taken 4,500 feet northwest of opening, room 24, off left entry 3, off right section 3 of Elk Lick No. 1 mine.

Sample 6302 was taken 2,600 feet northwest of opening in face of right entry 6, off west main entry of No. 2 mine.

Sample 6307 was taken 2,000 feet northwest of opening in extension of left heading 2 in No. 3 mine.

Notes.—The coal from two beds—Pittsburgh and Redstone—was loaded over same tipple, but was not mixed. Daily output of No. 1 was 1,700 tons; of No. 2, 350 tons; and of No. 3, which was not in operation, 600 tons.

For chemical analyses of this coal see part I of this bulletin, p. 174.

MEYERSDALE. SUMMIT NOS. 1 AND 2 MINES.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6303, 6308, 6309 (p. 174).

Mines.—Summit Nos. 1 and 2; Meyersdale district; drift mines 1½ miles southwest of Meyersdale, on the Baltimore & Ohio Railroad.

Coal beds.—Pittsburgh (Summit No. 1) and Redstone (Summit No. 2). Carboniferous age, Monongahela formation. The Redstone bed is about 4 feet thick; Pittsburgh bed, about 7¾ feet.

The coal was measured and sampled at Summit No. 1 mine by K. M. Way (6303) and at No. 2 mine by K. M. Way (6308) and P. M. Riefkin (6309) on July 28, 1908, as described below:

Sections of coal beds in Summit Nos. 1 and 2 mines, 1½ miles southwest of Meyersdale.

Laboratory No.	6303		6308		6309	
	Ft.	in.	Ft.	in.	Ft.	in.
Roof, shale.						
Coal	2	¼	0	5½	1	8½
Bone	[a] 0	2½	..	..	0	½
Sulphur	..	..	0	¼	..	..
Coal	[a] 0	4¼	1	3	1	2½
Bone	[a] 0	1½	0	½	0	½
Coal	0	9	1	3½	1	¼
Bone	0	¾	0	½	..	..
Coal	0	6¾	0	3	..	..
Bone	[a] 0	4¼	0	¼	..	..
Coal	0	8½	0	7	..	..
Shale and coal	[a] 0	9	..	..	..	..
Coal	0	5¼	..	..	..	..
Bone	0	½	..	..	..	..
Coal	1	4	..	..	..	..
Floor, shale.						
Thickness of bed	7	8½	3	11½	4	¼
Thickness of coal sampled	5	11	3	11½	4	¼

[a] Not included in sample.

Sample 6303 was taken 4,000 feet northwest of opening, in face of right heading 4 of No. 1 mine.

Sample 6308 was taken 2,000 feet northeast of opening, in face of right heading 2 of No. 2 mine.

Sample 6309 was taken 3,500 feet northeast of opening, in face of right heading 7 of No. 2 mine.

Notes.—Coal was all shipped in run-of-mine form and was sent to cars on inclined chute 300 feet long. Two men on cars picked out impurities. The product of these two mines was shipped together, with consequent higher ash product than if the Pittsburgh bed only had been loaded. Daily output of No. 1 was 900 tons and of No. 2, 250 tons.

For chemical analyses of this coal see part I of this bulletin, p. 174.

RALPHTON. RALPHTON NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6268, 6269 (p. 175).

Mine.—Ralphton No. 1; a slope mine at Ralphton, on the Baltimore & Ohio Railroad.

Coal bed.—Upper Kittanning or C′. Carboniferous age, Allegheny formation. The coal as sampled ranged in thickness from 3 feet 5 inches to 3 feet 7 inches. The roof is a hard shale which stands well in the rooms. The floor is a hard shale.

The bed was measured and sampled at two points by K. M. Way on July 20, 1908, as described below:

Sections of coal bed in Ralphton No. 1 mine at Ralphton.

Section	A		B	
Laboratory No.	6268		6269	
	Ft.	in.	Ft.	in.
Roof, shale.				
Bone and shale	[a] 0	4	[a] 0	5½
Coal	0	6½	0	7
Shale	0	½	..	..
Bone	..	..	0	1½
Coal	2	6¼	1	7
Mother coal	..	..	0	¼
Coal	..	..	0	8½
Mother coal	..	..	0	⅜
Coal	..	..	0	2½
Floor, shale.				
Thickness of bed	3	5¼	3	8⅝
Thickness of coal sampled	3	1¼	3	3⅛

[a] Not included in sample.

Section A (sample 6268) was cut from the face of west entry 2, off right heading 7, about 4,000 feet west.

Section B (sample 6269) was cut from face of dip entry 1, about 2,300 feet south.

Notes.—The daily output of this mine at the time sampled was about 1,000 tons. It was equipped with a modern wood tipple capable of handling large tonnages.

For chemical analyses of this coal see part I of this bulletin, p. 175.

STOUGHTON. JENNER NO. 1 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6267 and 6270 (p. 175).

Mine.—Jenner No. 1; Somerset district; a slope mine at Stoughton, on the Somerset Branch of the Baltimore & Ohio Railroad.

Coal bed.—Upper Kittanning, or C′ of the State Survey reports. Carboniferous age, Allegheny formation. The bed where sampled varied in thickness from 3 feet 8½ inches to 3 feet 10 inches.

The bed was measured and sampled at two points by K. M. Way and P. M. Riefkin on July 20, 1908, as described below:

Sections of coal bed in Jenner No. 1 mine, at Stoughton.

Section	A		D	
Laboratory No.	6267		6270	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	1¼	0	11
Bone	0	¼	..	..
Mother coal	..	..	0	¼
Coal	2	9¼	2	9¼
Floor, shale.				
Thickness of bed	3	10¾	3	8½
Thickness of coal sampled	3	10¾	3	8½

Section A (sample 6267) was cut from the face of right entry 3, of No. 1 dip, 1,300 feet northeast.

Section B (sample 6270) was cut from the face of third dip, 1,500 feet southwest.

For chemical analyses of this coal, see part I of this bulletin, p. 175.

WINDBER. EUREKA NO. 31 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 9004, 9005, 9006, 9007, 9008, 9009, 9020, 9021 (p. 175).

Mine.—Eureka No. 31; a drift mine in the Windber district, at Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The coal has an average thickness of 4 feet; has a good roof of gray shale, and a hard, smooth floor of clay.

The bed was measured and sampled at six points by H. M. Wolflin on August 30, 1909, as described below:

Sections of coal bed in Eureka No. 31 mine, at Windber.

Section	A		B		C		D		E		F	
Laboratory No.	9004		9005		9008		9006		9007		9009	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, gray shale.												
Coal	0	8½	1	2½	0	8½	..	..	..	..	..	..
Coal (hard gray)	0	1	0	½	..	..	..	..	..	..	0	10
Bone	..	..	..	..	0	½	..	..	..	..	..	..
Coal	0	3	1	11½	..	..	..	..	..	..	..	..
Pyrites	..	..	..	..	..	..	..	..	..	..	*a* 0	¼
Coal (hard)	0	½	..	..	..	..	..	..	..	..	..	..
Coal (tough)	..	..	..	..	1	2	0	7	1	0	..	..
Coal	0	2½	..	..	1	8	0	2½	..	..	0	4
Bone	..	..	*a* 0	3½	..	..	0	¼	0	½	..	..
Coal (gray)	0	4½	..	..	..	..	0	10¾	0	7½	0	8
Coal	0	7	0	7½	..	..	2	3	2	1	2	½
Mother coal	0	½	..	..	..	..	..	..	..	..	..	..
Coal (hard)	0	6½	..	..	..	..	..	..	..	..	..	..
Floor, hard, smooth clay.												
Thickness of bed	2	10	4	1½	3	7	3	11½	3	9	3	10¾
Thickness of coal sampled	2	10	3	10	3	7	3	11½	3	9	3	10½

a Not included in sample.

Section A (sample 9004) was cut from the pillar of room 4, on south entry 7, off west entry 46, off main entry.

Section B (sample 9005) was cut from the pillar of room 13, on south entry 3, off west entry 46, off main entry.

Section C (sample 9008) was cut from the face in a room on left entry 2, off new drift.

Section D (sample 9006) was cut from pillar 13, off east entry 56, off main entry.

Section E (sample 9007) was cut from the entry pillar near room 4, on east entry 36, off main entry.

Section F (sample 9009) was cut from the face of room 1, off southwest entry 15, off main entry.

A composite sample was made by mixing pillar samples 9004, 9005, 9006, and 9007 for an ultimate analysis, the results of which are shown under laboratory No. 9021.

A composite sample was also made by mixing face samples 9008 and 9009 for an ultimate analysis, the results of which are shown under laboratory No. 9020.

Notes.—The coal at this mine was undercut in the bottom part of the bed with puncher machines, and was shot down with black powder. There were no screens, the entire output being loaded as run-of-mine coal. The coal was picked by one man as it was loaded on the car. When sampled in 1909 the mine had a capacity of 2,200 tons, and an average daily output of about 1,040 tons. The maximum day's run was 2,700 tons. The mine had 370 acres of solid coal to work out. The tonnage for several years was expected to be 60 per cent from advance work and 40 per cent from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 175.

WINDBER. EUREKA NO. 32 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8949, 8950, 8951, 8952, 8953, 9022 (p. 175).

Mine.—Eureka No. 32; a drift mine in the Windber district, at Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 3½ feet, and varies from 3 feet to 4 feet 2 inches. The roof is a thickly bedded gray shale, having a thickness of 2½ feet, and being overlain with sandstone. The floor is a hard clay with smooth surface.

The bed was measured and sampled at five points by H. M. Wolflin on August 26, 1909, as described below:

Sections of coal bed in Eureka No. 32 mine, at Windber.

Section	A		B		C		D		E	
Laboratory No	8949		8950		8951		8952		8953	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Dirty top coal[a]	0	1	..	..	0	1½	0	2½	0	3
Coal	0	7½	0	9	0	7	0	8¼	0	9½
Coal, dull, cubical	0	9	..	..	..	..	..	..	..	..
Coal, tough	..	..	0	2	..	..	..	..	..	..
Bone	..	..	..	..	0	½	0	¾	0	½
Coal, gray	..	..	0	10½	0	10	..	..	1	8
Coal	2	2	..	..	..	..	2	8½	..	..
Coal, mother coal streaks	..	..	2	½	2	0	..	..	1	1½
Floor, hard clay.										
Thickness of bed	3	7½	3	10	3	7	3	8	3	10½
Thickness of coal sampled	3	6½	3	10	3	5½	3	5½	3	7½

[a] Not included in sample.

Section A (sample 8949) was cut from a pillar on the main entry near right entry 16, 8,000 feet S. 65° E. from the drift mouth.

Section B (sample 8950) was cut from the pillar of west entry 4, off right entry 12, off main entry, 6,800 feet S. 60° E. from the drift mouth.

Section C (sample 8951) was cut from right entry 26, off main entry 41, near room 14, 12,000 feet S. 75° E. from the drift mouth.

Section D (sample 8952) was cut from the entry pillar near room 2 on right entry 6, off main entry, 2,800 feet S. 60° E. from the drift mouth.

Section E (sample 8953) was cut from a barrier pillar of left entry 5, off main entry 2, 3,300 feet N. 80° E. from the drift mouth.

A composite sample was made by mixing samples 8949, 8950, 8951, 8952, and 8953 for an ultimate analysis, the results of which are shown under laboratory No. 9022.

Notes.—At the time of sampling, the coal at this mine was undercut in the bottom part of the bed with puncher machines, and was shot down with black powder. There were no screens at the tipple, the entire output being loaded as run-of-mine coal. One trimmer picked the coal as it was loaded on the cars. The mine had a capacity of 1,500 tons, and an average daily output of 566 tons, 98 per cent of which was from pillar coal. The estimated life of the mine was about 9 years.

For chemical analyses of this coal see part I of this bulletin, p. 175

WINDBER. EUREKA NO. 35 MINE.

Sample.—Semibituminous coal; Windber field, analyses Nos. 8873, 8874, 8875, 8876, 8877, 8878, 8879, 8939, 8940 (p. 176).

Mine.—Eureka No. 35; a drift mine in the Windber district, at Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. The coal has an average thickness of 3 feet 9 inches, varying from 3 feet to 5 feet. It is overlain with a hard shale, which makes a good roof. From 4 to 6 inches of the top part of the coal is bony and is generally left up for a roof. The floor is a shaly blue clay with a fairly smooth surface.

The bed was measured and sampled at seven points by H. M. Wolflin on August 19 and 20, 1909, as described below:

Sections of coal bed in Eureka No. 35 mine, at Windber.

Section	A		B		C		D		E		F		G	
Laboratory No.	8875		8874		8879		8878		8873		8877		8876	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale and top coal.														
Coal, hard, gray, cubical	..	..	..	..	..	..	..	..	..	..	0	7½	..	..
Coal	0	4	1	1	0	4½	0	8	0	5	..	..	0	4
Coal, dull vitreous	0	10	0	5	0	10	..	..	..	..	0	1	0	2½
Coal	1	11½	..	..	0	10	..	..	..	..	0	2	0	3
Coal, gray	..	..	1	0	1	10½	1	7	0	7	0	9	0	10½
Coal	..	..	1	1¾	..	..	1	6	2	0	1	11	2	0
Floor, shaly blue clay.														
Thickness of bed	3	1½	3	7¾	3	11	3	9	3	0	3	6½	3	8
Thickness of coal sampled	3	1½	3	7¾	3	11	3	9	3	0	3	6½	3	8

Section A (sample 8875) was cut from the face of the main air course. (This sample was high in moisture, because the entry where it was taken was very wet.)

Section B (sample 8874) was cut from the face of right entry 23, off the main entry.

Section C (sample 8879) was cut from a pillar between rooms 33 and 34 on left entry 16, off main entry.

Section D (sample 8878) was cut from the pillar of room 6, off left entry 8, off main entry.

Section E (sample 8873) was cut from the face of right entry 23, off north entry.

Section F (sample 8877) was cut from the pillar of right entry 11, off north entry.

Section G (sample 8876) was cut from the face of left entry 21, off main entry.

Composite samples were made by mixing the face samples 8873, 8874, 8875, and 8876, and by mixing the pillar samples 8877, 8878, and 8879 for ultimate analyses, the results of which are shown under laboratory numbers 8939 and 8940, respectively.

Notes.—The coal at this mine was undercut with puncher machines and was shot down with black powder. There were no screens, the coal being loaded entirely in run-of-mine form. It was picked by two men as it was loaded on the car.

The average daily output of the mine in August, 1909, was 1,587 tons, the maximum day's run being 2,500 tons. The output was to be derived from both pillars and from advance work in the proportion of 95 per cent from advance work. There were 2,900 acres of solid coal in this property, assuring a long life.

For chemical analyses of this coal see part I of this bulletin, pp. 176, 177.

WINDBER. EUREKA NO. 35-C′ MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8964, 8965, 8966, 9025 (p. 177).

Mine.—Eureka No. 35-C′, a drift mine in the Windber district, at Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Upper Kittanning or C′. Carboniferous age, Allegheny formation. The coal at this mine varies from 5½ feet to 6½ feet in thickness; has a bony-coal roof about 10 inches thick, above which is a clay shale; floor of shaly clay, with a smooth surface.

The bed was measured and sampled at three points by H. M. Wolflin on August 27, 1909, as described below:

Sections of coal bed in Eureka No. 35-C′ mine at Windber.

Section	A		B		C	
Laboratory No	8964		8965		8966	
Roof, shale and top coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	1½	0	2	0	2
Coal	1	4½	1	4½	1	2
Bony coal	0	3½	0	3	0	5
Coal (gray, tough)	2	9	2	10	2	6½
Floor, clay.						
Thickness of bed	4	6½	4	7½	4	3½
Thickness of coal sampled	4	5	4	5½	4	1½

[a] Not included in sample.

Section A (sample 8964) was cut from the face of right entry 2, off main entry.

Section B (sample 8965) was cut from the face of the main entry, 150 feet from right entry.

Section C (sample 8966) was cut from the face of left air course 2, off the main entry.

A composite sample was made by mixing the face samples 8964, 8965, and 8966 for an ultimate analysis, the results of which are shown under laboratory number 9025.

Notes.—The coal at this mine was undercut with puncher machines in the bottom part of the bed, and was shot down with black powder. The tipple had no screens, all the coal being loaded in run-of-mine form. The capacity of the mine was 130 tons at the time of sampling and the average daily output was 100 tons.

For chemical analyses of this coal see part I of this bulletin, p. 177.

WINDBER. EUREKA NO. 30 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8943, 8944, 8945, 8946, 8947, 8948, 9019 (p. 177).

Mine.—Eureka No. 30; a drift mine in the Windber district, 1½ miles west of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. Thickness, uniform, ranging as mined from 2 feet 9 inches to 3 feet 6 inches; roof, thick-bedded sandstone on the right of the main entry, and tender clay shale on the left thereof; floor, hard underclay with smooth surface; cover, for the most part, 130 to 225 feet.

The bed was measured and sampled at six points by R. Y. Williams on August 27, 1909, as described below:

Sections of coal bed in Eureka No. 30 mine, 1½ miles west of Windber.

Section	A		B		C		D		E		F	
Laboratory No.	8943		8944		8945		8946		8947		8948	
Roof, secs. A, C, F, sandstone; secs. B, D, E, clay shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal (grainy)	[a] 0	8	[a] 0	7	[a] 0	6	[a] 0	10	[a] 0	7	[a] 0	3
Sulphurous bone to shale	[a] 0	¼	[a] 0	¼	[a] 0	¾	[a] 0	¼	[a] 0	1	..	..
Gray coal	..	..	[a] 0	4	..	..	..	..	..	..	..	..
Soft bright coal	0	4	2	8½	0	5	0	7	0	1½	0	5
Sulphur and bone streak	[a] 0	¼	..	..	Trace.		0	½	0	½	0	¼
Soft bright coal	0	9	..	..	0	3	1	7½	0	6½	0	3½
Bony coal to gray coal	[a] 0	⅛	..	..	0	4	[a] 0	½	0	⅛	0	½
Soft bright coal	2	2¼	..	..	0	5	0	3	1	0	2	10½
Sulphur streak	..	..	[a] 0	¼	[a] 0	¼	0	¼	[a] 0	¼	..	..
Soft bright coal	..	..	0	5¼	1	7½	0	9½	1	¾	..	..
Floor, hard clay.												
Thickness of bed	3	11⅞	4	1¼	3	7½	4	2¼	3	5⅝	3	10¾
Thickness of coal sampled	3	3¼	3	1¾	3	½	3	3¾	2	9⅜	3	7¾

[a] Not included in sample.

Section A (sample 8943) was cut from a chain pillar on right entry 1, off right entry 10, 9,500 feet from the drift mouth. This pillar had been standing about 16 months.

Section B (sample 8944) was cut from a chain pillar on left entry 10, off the main entry, 9,500 feet from the drift mouth. This pillar had been standing about three years.

Section C (sample 8945) was cut from the face of right entry 13, off main entry 1, 10,000 feet from the drift mouth.

Section D (sample 8946) was cut from the face of room 11 on left entry 11, off main heading 2, 10,800 feet from the drift mouth.

Section E (sample 8947) was cut from the face of left entry 15, off main entry 2, 11,500 feet from the drift mouth.

Section F (sample 8948) was cut from the face of left entry 15, off main entry 1, 10,500 feet from the drift mouth.

A composite sample was made by mixing the face samples 8945, 8946, 8947, and 8948 for an ultimate analysis, the results of which are shown under laboratory number 9019.

Notes.—The coal at this mine was undercut in bottom part of bed by puncher machines, and was shot down with black powder. The tipple was not equipped with screens, so that the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on the cars. The capacity of this mine was 2,750 tons daily, the average output at the time of sampling being 980 tons. The future output was to be derived both from advance work and from pillars in about equal proportions.

For chemical analyses of this coal see part I of this bulletin, p. 178.

WINDBER. EUREKA NO. 33 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8954, 8955, 8956, 8957, 8958, 9023 (pp. 177, 178).

Mine.—Eureka No. 33, a drift mine in the Windber district, 2 miles south of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, or B of the State Survey reports; Carboniferous age, Allegheny formation. Thickness, uniform, ranging as mined from 3 feet 5 inches to 4 feet, and dipping 1¾° S. 30° E.; roof, strong gray shale, 2 feet thick and capped with sandstone; floor, hard clay with smooth surface; cover, for the most part, 80 to 100 feet.

The bed was measured and sampled at five points by R. Y. Williams on August 28, 1909, as described below:

Sections of coal bed in Eureka No. 33 mine, 2 miles south of Windber.

Section	A		B		C		D		E	
Laboratory No.	8954		8955		8956		8957		8958	
Roof, strong gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal [a]	0	3	0	7	0	8	0	7	0	4
Pyrites	..	..	0	⅛	..	..	..	..	..	..
Coal	0	9¾	0	8	0	6	1	3	1	2
Mother coal	..	..	..	..	..	..	0	⅛	..	..
Bony coal	0	¼	0	½	0	½	..	..	..	..
Coal (gray)	0	6½	0	6	0	6	..	..	..	4½
Coal	1	1½	1	10½	1	6½	2	4	1	9
Mother coal [a]	..	..	..	..	0	1	..	..	..	..
Coal	..	..	..	..	0	1	..	..	..	..
Pyrites [a]	0	1	0	¼	0	¼	..	..	0	½
Coal	0	10½	0	3½	0	5	..	..	0	3
Floor, hard clay.										
Thickness of bed	3	8½	3	11⅞	3	10¼	4	2⅛	3	11
Thickness of coal sampled	3	4½	3	4⅝	3	1	3	7⅛	3	6½

[a] Not included in sample.

Section A (sample 8954) was cut from the last chain pillar on the main entry, 6,000 feet from the drift mouth.

Section B (sample 8955) was cut from the pillar of right entry 12, 4,600 feet from the drift mouth.

Section C (sample 8956) was cut from the last pillar of main entry 2, off right entry 9, 4,500 feet from the drift mouth.

Section D (sample 8957) was cut from the pillar of room 1, off left entry 5, 2,200 feet from the drift mouth.

Section E (sample 8958) was cut from the barrier pillar of left entry 3, off the main entry, 1,200 feet from the drift mouth. This sample was wet.

A composite sample was made by mixing the pillar samples 8954, 8955, 8956, 8957, and 8958 for an ultimate analysis, the results of which are shown under laboratory number 9023.

Notes.—The coal at this mine was undercut in bottom part of bed by air puncher machines, and was shot down with black powder. The tipple was not equipped with screens, so that the entire output was shipped as run of mine. The coal cokes, but there were no ovens at this plant. The coal was picked on car. The daily output at the time of sampling averaged 600 tons, 1,500 tons being the maximum day's run. The mine was nearing exhaustion and the output was to be derived entirely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 178.

WINDBER. EUREKA NO. 34 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8959, 8960, 8961, 8962, 8963, 9024 (p. 178).

Mine.—Eureka No. 34; a drift mine in the Windber district, 1½ miles south of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. At this mine it averages 3½ feet in thickness, varying from 3 to 4½ feet. The roof is poor; a thick, bedded, clay shale. The floor is a hard clay, which has a smooth surface.

The bed was measured and sampled at five points by H. M. Wolflin on August 28, 1909, as described below:

Sections of coal bed in Eureka No. 34 mine, 1½ miles south of Windber.

Section	A		B		C		D		E	
Laboratory No	8959		8960		8961		8962		8963	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	..	..	[a] 0	7	..	..	[a] 0	2	[a] 0	1½
Coal (with mother coal streaks)	1	0	..	..	..	..	..	..	1	1
Coal (with sulphur streaks)	..	..	[a] 0	3	..	..	..	..	0	¾
Coal (hard)	0	½	..	..	..	..	..	..	..	..
Coal	..	..	0	7	0	8¼	..	..	..	..
Coal (hard, gray)	1	1¾	0	1	0	11	1	9	0	7½
Sulphur	0	¾	..	..	..	..	..	..	0	¼
Coal (gray)	..	..	0	10	..	..	..	..	0	10¼
Sulphur	..	..	..	..	..	..	..	..	0	¼
Coal	1	8½	2	0	1	9¾	1	10	1	3
Floor, hard clay.										
Thickness of bed	3	11½	4	4	3	5	3	9	4	½
Thickness of coal sampled	3	11½	3	6	3	5	3	7	3	11

[a] Not included in sample.

Section A (sample 8959) was cut from a pillar near room 26, off south entry 1, off right entry 13, off main entry.

Section B (sample 8960) was cut from a pillar near room 19 on left entry 15, off main entry 2.

Section C (sample 8961) was cut from the face of room 21 on left entry 2, off main entry.

Section D (sample 8962) was cut from the face near the head of the main air course.

Section E (sample 8963) was cut from the face of south entry 5 off right entry 18, off main entry 1.

A composite sample was made by mixing the face samples 8961, 8962, and 8963 for an ultimate analysis, the results of which are shown under laboratory number 9024.

Notes.—The coal at this mine was undercut in the bottom part of the bed by puncher machines and was shot down with black powder. There were no screens at the tipple, the coal being loaded entirely in run-of-mine form. One trimmer cleaned the coal as it was loaded on the cars. The capacity of the mine was 1,200 tons, the maximum day's run being 1,540 tons. The average daily output was 524 tons. The future supply was to be derived from both pillars and advance work in equal proportions. There were 600 acres of unmined coal.

For chemical analyses of this coal see part I of this bulletin, p. 178.

WINDBER. EUREKA NO. 36 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 6274, 6275, 6276, 8920, 8921, 8922, 8923, 8924, 8925, 9026, 9027 (pp. 178, 179).

Mine.—Eureka No. 36, a drift mine in the Windber district, 1½ miles east of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Lower Kittanning, Miller, or B of the State Survey reports. Carboniferous age, Allegheny formation. At this mine the bed averages 3½ feet in thickness and is nearly uniform. The roof is thick-bedded shale, its maximum thickness being 5¾ feet, above which is sandstone. This shale in places is cut out so that the sandstone forms the roof of the coal. The sandstone roof is good, and the shale roof variable in character. The floor is a shaly clay, which, to a slight extent, got mixed with the coal.

The bed was measured and sampled at six points by H. M. Wolflin on August 21 and 23, 1909, as described below:

Sections of coal bed in Eureka No. 36 mine, 1½ miles east of Windber.

Section	A		B		C		D		E		F	
Laboratory No	8920		8921		8922		8923		8924		8925	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale and sandstone.												
Top coal [a]	0	5	0	4½	0	4½	..	..	..	..	0	2
Coal (tough)	..	..	0	6	1	1	..	..	0	6½	..	..
Coal (hard)	1	2	..	..	..	..	0	10	..	..	..	..
Coal (tough)	..	..	0	7½	..	..	..	..	..	..	..	..
Coal	1	10	2	1½	0	3	..	..	0	2½	1	7
Coal (hard)	..	..	..	..	..	..	0	½	0	1	..	..
Coal	..	..	..	..	..	..	0	8	2	7½	1	9
Coal (mother-coal streaks)	..	..	..	..	1	11½	2	½	..	..	0	3
Floor, hard clay.												
Thickness of bed	3	5	3	7½	3	8	3	7	3	5½	3	9
Thickness of coal sampled	3	0	3	3	3	3½	3	7	3	5½	3	7

[a] Not included in sample.

Section A (sample 8920) was cut from the face of main entry 1, 75 feet from right entry 25, 8,300 feet N. 21° E. of the drift mouth.

Section B (sample 8921) was cut from the face of north entry 4, off left entry 18, off main entry 1, 7,800 feet north of the drift mouth.

Section C (sample 8922) was cut from pillar 7 on right entry 13, off main entry 1, 5,200 feet N. 26° E. of the drift mouth.

Section D (sample 8923) was cut from pillar 14 on right entry 16, off main entry 2, 6,300 feet N. 55° E. of the drift mouth.

Section E (sample 8924) was cut from pillar 20, on right entry 10, off main entry 3, 6,200 feet east of the drift mouth.

Section F (sample 8925) was cut from the face of main entry 2, 350 feet from right entry 24, 9,800 feet N. 46° E. of the drift mouth.

Composite samples were made by mixing the face samples 8920, 8921, and 8925 and by mixing the pillar samples 8922, 8923, and 8924 for ultimate analyses, the results of which are shown under laboratory Nos. 9026 and 9027, respectively.

The bed was also measured and sampled at three points on July 23, 1908, by K. M. Way and P. M. Riefkin, Nos. 6274 and 6276 being taken by Way and No. 6275 by Riefkin, as described below:

Sections of coal bed in Eureka No. 3 mine, 1¼ miles east of Windber.

Laboratory No	6274		6275		6276	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal	1	3	0	11	2	6¼
Mother coal	0	¼	..	..	0	¼
Bone	..	..	0	¼	..	..
Coal	1	3½	0	11	1	2
Sulphur	0	¼	0	⅛	..	..
Shale	..	..	..	..	[a] 0	7
Coal	1	0	0	10½	[a] 1	4½
Shale	[a] 0	7	..	..	..	..
Sulphur	..	..	0	¼	..	..
Coal	[a] 1	4½	0	9	..	..
Shale	..	..	[a] 0	7	..	..
Coal	..	..	[a] 1	4½	..	..
Floor, clay.						
Thickness of bed	5	6½	5	5⅝	5	8
Thickness of coal sampled	3	7	3	6⅛	3	8½

[a] Not included in sample.

Sample 6274 was taken 8,500 feet north of opening, in room 1, off right heading 21, off main entry, near face of entry.

Sample 6275 was taken 9,000 feet northeast of opening, between right headings 22 and 23, off right slant 14.

Sample 6276 was taken 8,500 feet northeast of opening, in right entry 19, off main slant 3.

Notes.—The coal at this mine was undercut by puncher machines, and was shot down with black powder. There were no screens at the tipple. The coal was all loaded in run-of-mine form, and was picked by one trimmer as it was loaded on the car. The mine had a capacity of 4,000 tons at the time it was sampled, the maximum output for one day being 5,000 tons. The average daily output was 2,077 tons. There were 2,450 acres of coal to be taken out by this mine, insuring a long life. The tonnage of the near future was to be largely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 178.

WINDBER. EUREKA NO. 39 MINE.

Sample.—Semibituminous coal; Windber field; analyses Nos. 8969, 8970, 8971, 8972, 8973, 8974, 9030 (p. 179).

Mine.—Eureka No. 39; a drift mine in the Central Pennsylvania district, 3½ miles southwest of Windber, on the South Fork Branch of the Pennsylvania Railroad.

Coal bed.—Upper Kittanning, or C′ of the State Survey reports. Carboniferous age, Allegheny formation. Thickness at this mine, uniform, ranging as mined from 3 feet 2 inches to 3 feet 8 inches, and dipping 2° S. 30° W.; roof, strong gray shale, varying from a knife-edge to 8 feet in thickness, and capped with sandstone; floor, hard clay with smooth surface; cover, for the most part, 115 to 250 feet.

The bed was measured and sampled at six points by R. Y. Williams on August 30, 1909, as described below:

Sections of coal bed in Eureka No. 39 mine, 1½ miles southeast of Windber.

Section	A		B		C		D		E		F	
Laboratory No.	8969		8970		8971		8972		8973		8974	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7¼	0	8	0	7½	0	6½	0	9	0	9½
Bony coal[a]	0	1¾	0	1	0	½	0	1	0	½	0	2
Coal (hard)	0	3	..	..	..	..	..	..	..	..	..	..
Coal	1	6	0	4	..	..	0	5	0	2	0	6
Coal (gray)	0	2	0	2½	0	4	0	1	0	3	0	2
Coal	0	4¼	2	¾	2	1¼	2	¾	2	2	0	6¾
Pyrites[a]	..	..	..	..	..	..	..	..	..	..	0	1
Coal	..	..	..	..	..	..	..	..	..	..	1	6¼
Floor, hard clay.												
Thickness of bed	3	¼	3	4¼	3	1¼	3	2¼	3	4½	3	9½
Thickness of coal sampled	2	10½	3	3¼	3	¾	3	1¼	3	4	3	6½

[a] Not included in sample.

Section A (sample 8969) was cut from the face of south entry 7, off left entry 1, 5,300 feet from the drift mouth.

Section B (sample 8970) was cut from the face of room 16, on south entry 9, off right entry 1, 5,300 feet from drift mouth.

Section C (sample 8971) was cut from the face of north entry 7, off right entry 1, 5,100 feet from the drift mouth.

Section D (sample 8972) was cut from the face of room 20, on north entry 4, off right entry 1, 4,700 feet from the drift mouth.

Section E (sample 8973) was cut from the face of the main entry, 5,200 feet from the drift mouth.

Section F (sample 8974) was cut from the face of left entry 9, off the main entry, 5,300 feet from the drift mouth.

A composite sample was made by mixing the face samples 8969, 8970, 8971, 8972, 8973, and 8974 for an ultimate analysis, the results of which are shown under laboratory No. 9030.

Notes.—The coal at this mine was undercut in the bottom part of the bed by chain-and-puncher machines, and was shot down with black powder. It was not equipped with screens, so that the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on the car by one trimmer. The daily output averaged 1,000 tons, 1,400 tons being the maximum day's run. The future production was to be derived both from advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 179.

WINDBER. SOMERSET AND CAMBRIA MINE.

Sample.—Semibituminous coal; Windber field; analysis No. 3837 (p. 180).

Mine.—Somerset and Cambria; on Stony Creek, 4 miles southwest of Windber, on the Baltimore & Ohio Railroad.

Coal bed.—Lower Kittanning, Miller, or B. Carboniferous age, Allegheny formation.

The bed was measured and sampled on July 24, 1906, by W. C. Phalen, as shown below:

Section of coal bed in Somerset and Cambria mine, 3 miles west of Windber.

Laboratory No.	3837	
	Ft	in.
Roof, hard shale.		
Coal	3	10
Shale [a]	0	7
Coal	2	0
Floor, clay.		
Thickness of bed	6	5
Thickness of coal sampled	5	10

[a] Not included in sample.

Note.—Output in 1910, 47,671 tons.

For chemical analyses of this coal see part I of this bulletin, p. 179; also U. S. Geol. Survey Bull. 316, p. 24.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 21.

SULLIVAN COUNTY.

BERNICE. CONNELL MINE.

Sample.—Semianthracite coal; analysis Nos. 9654 and 9665 (p. 180).

Mine.—Connell; Bernice district, at Bernice.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation.

The bed was measured and sampled at two points on December 31, 1909, by C. A. Fisher, as shown below:

Sections of coal bed in Connell mine, at Bernice.

Laboratory No.	9654		9655	
	Ft.	in.	Ft.	in.
Coal	3	1	1	6
Parting [a]	..	..	0	5
Coal	..	..	1	2
Parting [a]	..	..	0	1
Coal	..	..	2	10
Thickness of bed	3	1	6	0
Thickness of coal sampled	3	1	5	6

[a] Not included in sample.

Sample 9654 was taken from chamber 4 off AA entry.

Sample 9665 was taken from chamber 69 off A entry.

For chemical analyses of this coal see part I of this bulletin, p. 180.

BERNICE. RANDALL AND SHAAD MINE.

Sample.—Semianthracite coal; analysis No. 9652 (p. 180).

Mine.—Randall and Shaad; Bernice district, three-fourths mile east of Bernice.

Coal bed.—Lower Kittanning or B (lower). Carboniferous age, Allegheny formation.

The bed was measured and sampled on December 31, 1909, by C. A. Fisher.

Sample 9653 represented a 1-foot 3½-inch cut of coal from the lower bench of a 2-foot 3½-inch bed. The sample was taken from the face of breast 3, Dashuer entry.

For chemical analyses of this coal see part I of this bulletin, p. 180.

BERNICE. O'BOYLE AND FAY MINE.

Sample.—Semianthracite coal; analysis Nos. 9653, 9656 (p. 180).

Mine.—O'Boyle and Fay; Bernice district; 1¼ miles east of Bernice.

Coal beds.—Lower Kittanning or "B and a bed 50 feet above the B." Carboniferous age, Allegheny formation.

The bed was measured and sampled at two points on December 31, 1910, by C. A. Fisher, as shown below:

Sections of coal bed in O'Boyle and Fay mine 1¼ miles east of Bernice.

Laboratory No.	9653		9656	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	3	1	11
Parting [a]	0	2	0	3
Coal	0	3	1	7
Parting [a]	0	5	0	2
Coal	2	4	2	9
Thickness of bed	3	5½	6	8
Thickness of coal sampled	2	10½	6	3

[a] Not included in sample.

Sample 9653 was taken in the face of main entry, 120 feet from opening. It was taken from a bed lying 50 feet above the B bed.

Sample 9656 was taken from the Johnson entry, off entry 3. The sample included the upper and lower benches of the B bed.

For chemical analyses of this coal see part I of this bulletin, p. 180.

LOPEZ. NORTHERN MINE.

Sample.—Semianthracite coal; analyses Nos. 9655, 9664 (p. 180.)

Mine.—Northern; Bernice district; 1 mile northwest of Lopez.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation.

The bed was measured and sampled at two points on December 31, 1909, by C. A. Fisher, as shown below:

Sections of coal bed in Northern mine, 1 mile northwest of Lopez.

Laboratory No.	9655		9664	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	4	1	6
Parting [a]	0	4½	0	5
Coal	4	4	3	0
Thickness of bed	7	½	4	11
Thickness of coal sampled	6	8	4	6

[a] Not included in sample.

Sample 9655 was taken from the east gangway, left heading 1.

Sample 9664 was taken from the north gangway, left chamber 1.

For chemical analyses of this coal see part I of this bulletin, p. 180.

WASHINGTON COUNTY.

ACHESON. ACHESON MINE.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 12) analyses Nos. 3441, 3442 (pp. 180, 181).

Mine.—Acheson, a drift mine in the Pittsburgh district, at Acheson, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness, at this mine, fairly uniform, averaging 5 feet 1 inch. The bed lies nearly flat. The roof is of bony coal 10 to 30 inches thick; above this is 8 inches of shale, and above the shale 30 inches of bony coal. The floor is a hard gray shale, generally good to shovel from, but in places rough. The bed is broken in places by roof rolls. The cover varies from 1 to 100 feet.

The bed was measured and sampled at two points in the mine by J. W. Groves and F. B. Tough in July, 1906, as shown below:

Sections of coal bed in Acheson mine, at Acheson.

Section	A		B	
Laboratory No	3441		3442	
Roof, bony coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4	0	5
Bony coal	0	½	0	⅞
Coal	1	11	1	1
Bony coal	0	¾	..	..
Mother coal	..	..	0	⅛
Coal	2	11	0	8
Bony coal	..	..	0	1
Coal	..	..	1	½
Mother coal	..	..	0	½
Coal	..	..	1	6
Floor, shale.				
Thickness of bed	5	3¼	4	11
Thickness of coal sampled	5	3¼	4	11

Section A (sample 3441) was measured in room 42, in north heading 2, 1,100 feet west of the drift mouth.

Section B (sample 3442) was measured in room 16, in heading 4, 1,600 feet southwest of the drift mouth.

Notes.—The output of this mine in 1906 was used in making coke near the mine. The approximate output of the mine during the preceding year was 300 tons per day.

For results of tests of this coal, see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 197; Bureau of Mines Bull. 13, pp. 190, 275; washing tests: U. S. Geol. Survey Bull. 332, p. 198; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 198; Bull. 336, pp. 24, 32, 41; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 198; Bull. 336, pp. 66, 69, 71, 73, 75.

For chemical analyses see part I of this bulletin, p. 180; also U. S. Geol. Survey Bull. 332, p. 197.

ACHESON. MILLOY COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 2631 (p. 181).

Location.—Milloy country bank; Pittsburgh district; about one-half mile east of Acheson, Lane Township.

Coal bed.—Waynesburg. The coal is of Carboniferous age, Monongahela formation.

The bed was measured and sampled by M. J. Munn in 1905. The sample was taken from a 4-foot cut of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 180.

ANDERSON. BLANCHE MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1033 (p. 181).

Mine.—Blanche; Pittsburgh district; at Anderson (Venetta), on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled on August 29, 1904, by F. G. Clapp and F. W. DeWolf, as shown below:

Section of coal bed in Blanche mine, at Anderson.

Laboratory No.	1033	
Roof, coal.	*Ft.*	*in.*
Clay [a]	0	10
Coal	3	0
Bearing in coal	0	3
Coal	2	4½
Thickness of bed	6	5½
Thickness of coal sampled	5	7½

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, pp. 95, 96.

BEALLSVILLE. COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1592 (p. 181).

Location.—Country bank; Pittsburgh district, 1$\frac{3}{10}$ miles northeast of Deemston and 2 miles south of Beallsville. No railroad connection.

Coal bed.—Waynesburg. Carboniferous age, Monongahela formation.

The bed was measured and sampled in 1904 by F. G. Clapp and F. W. De Wolf, as shown below:

Section of coal bed in country bank, 2 miles south of Beallsville.

Laboratory No.	1592	
	Ft.	*in.*
Coal [a]	0	10
Clay [a]	0	6
Coal	2	8
Clay [a]	0	4
Coal [a]	0	8
Thickness of bed	5	0
Thickness of coal sampled	2	8

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, p. 110.

BUFFALO. IMHOFF BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 2630 (p. 181).

Mine.—Imhoff country bank; Pittsburgh district, 1¾ miles south of Buffalo.

Coal bed.—Washington. The coal is of carboniferous age, Monongahela formation.

The bed was measured and sampled in 1905 by M. J. Munn. The sample represented 3 feet 9 inches of the lower part of a 7 to 8 foot bed.

For chemical analyses of this coal see part I of this bulletin, p. 181.

Charleroi. Charleroi Mine.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 11) analyses Nos. 3421, 3422 (p. 181).

Mine.—Charleroi; a drift mine, in the Pittsburgh district, at Charleroi, on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness at this mine fairly uniform, being about 5½ feet. The bed lies nearly flat. Above the bed proper is a soft shale, 10 to 16 inches thick. This shale comes down, leaving a bed of top coal which makes a good roof. The floor is a calcareous shale. The bed carries, as a regular band, two layers of shale 2 inches apart, which are thrown out in loading mine cars.

The bed was measured and sampled at two points in the mine by J. W. Groves in July, 1906, as shown below:

Sections of coal bed in Charleroi mine, at Charleroi.

Section	A		B	
Laboratory No.	3421		3422	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Shale	[a] 1	1	..	..
Coal	3	2	1	9
Sulphur	..	..	[a] 0	½
Shale	[a] 0	¼	..	..
Coal	[a] 0	2	1	4
Shale	[a] 0	½	[a] 0	½
Coal	2	1	[a] 0	2
Shale	..	..	[a] 0	½
Coal	..	..	1	3
Shale	..	..	0	¼
Coal	..	..	0	11
Floor, shale.				
Thickness of bed	6	6¾	5	6¾
Thickness of coal sampled	5	3	5	3¼

[a] Not included in sample.

Section A (sample 3421) was measured 4,000 feet southwest of the mine opening.

Section B (sample 3422) was measured 4,000 feet northwest of the mine opening.

Notes.—The coal bed at this mine has the usual characteristics of the Pittsburgh bed. The coal was used for steam production and was shipped by river to various centers of consumption. The approximate output of the mine in 1906 was 1,800 tons a day.

For results of tests of this coal, see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 195; Bureau of Mines Bull. 13, pp. 190, 275; coking tests: U. S. Geol. Survey Bull. 332, p. 195; Bull. 336, pp. 24, 32, 41; cupola tests of coke: U. S. Geol. Survey Bull. 332, p. 196; Bull. 336, pp. 66, 69, 71, 73, 75.

For chemical analyses see part I of this bulletin, p. 181; also U. S. Geol. Survey Bull. 332, p. 195.

Ellsworth. Ellsworth Nos. 1 and 2 Mines.

Sample.—Bituminous coal; Pittsburgh field; analyses Nos. 1047 and 1050, and (Pennsylvania No. 5) analyses Nos. 1966, 1967 (p. 181).

Mine.—Ellsworth Nos. 1 and 2; shaft mines in the Pittsburgh district, at Ellsworth on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness at this mine fairly uniform, averaging about 6 feet 9 inches. The bed lies nearly flat. The cover is about 200 feet thick. The roof is coal; the floor is limestone, but 4 to 6 inches of coal are left on the floor in mining. Above the coal regularly worked are bony coal and clay, one or both of which are drawn, as shown in the sections below. The bed carries partings of shale or bony coal.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on August 8, 1905, as shown below:

Sections of coal in Ellsworth Nos. 1 and 2 mines, at Ellsworth.

Section	A		B	
Laboratory No.	1966		1967	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Clay	[a] 1	3	..	..
Bone	[a] 0	1	[a] 0	1
Clay	..	..	[a] 1	0
Bone	..	..	[a] 0	1
Coal	2	11	3	1
Shale	[a] 0	¾	[a] 0	1
Bone	[a] 0	1¼	..	..
Shale	[a] 0	1	..	..
Coal	2	5	[a] 0	1
Shale	..	..	[a] 0	1
Coal	..	..	2	4
Floor, limestone.				
Thickness of bed	6	11	6	10
Thickness of coal sampled	5	4	5	5

[a] Not included in sample.

Section A (sample 1966) was measured in room 10, off butt entry 1, 3,000 feet southeast of the shaft, in Ellsworth No. 2 mine.

Section B (sample 1967) was measured in room 17, off butt entry 5, off the north entry, 3,000 feet north of the shaft, in Ellsworth No. 1 mine.

The bed was also measured and sampled on September 26, 1904, by F. G. Clapp and F. W. De Wolf, as shown below:

Sections of bed in Ellsworth Nos. 1 and 2 mines.

Laboratory No.	1047		1050	
	Ft.	*in.*	*Ft.*	*in.*
Bony coal [a]	0	1	..	..
Clay [a]	1	0	1	3
Bony coal [a]	0	1	0	1
Coal	3	1	2	11
Shale [a]	0	1	0	¾
Coal [a]	0	1	0	1¼
Shale [a]	0	1	0	1
Coal	2	4	2	5
Thickness of bed	6	10	6	11
Thickness of coal sampled	5	5	5	4

[a] Not included in sample.

Sample 1047 was taken from No. 1 mine.

Sample 1050 was taken from No. 2 mine.

Notes.—The coal from these mines was shipped for steam purposes and for gas production. Part of the output was made into coke.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 169; Bureau of Mines Bull. 23, pp. 67, 176; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 170; Bureau of Mines Bul. 13, pp. 184, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 171; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 171; Bull. 336, pp. 24, 31, 40; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 272, 273; Bull. 290, p. 169; Bull. 300, p. 96.

For geologic relations see U. S. Geol. Survey Bull. 300, p. 181.

FRANKFORT. OLLUM COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1072 (p. 181).

Location.—Ollum country bank; Pittsburgh district; southeast of Frankfort.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was sampled on September 10, 1904, by W. T. Griswold.

For chemical analyses of this coal see part I of this bulletin, p. 181.

For other mention of this sample see U. S. Geol. Survey Prof. Paper 48, pp. 112, 113.

HACKETT. NOTTINGHAM MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis 1035 (p. 181).

Mine.—Nottingham; Pittsburgh district; at Hackett, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled on August 29, 1904, by F. G. Clapp and F. W. De Wolf, as shown below:

Section of coal bed in Nottingham mine, at Hackett.

Laboratory No.	1035	
	Ft.	*in.*
Coal and bone[a]	0	10
Clay[a]	1	2
Coal and bone[a]	2	1
Clay[a]	0	11
Coal	2	11
Bearing-in coal	0	3
Coal	2	5
Thickness of bed	10	7
Thickness of coal sampled	5	7

[a] Excluded from sample.

The sample was taken from breast and bottom.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, pp. 95, 96.

For geologic relations see U. S. Geol. Survey Bull. 300, p. 181.

HACKETT. RUSSELL MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis, No. 1034 (p. 181).

Mine.—Russell; Pittsburgh district; above the Nottingham mine, at Hackett.

Coal bed.—Redstone. Carboniferous age, Monongahela formation.

The bed was measured and sampled on August 29, 1904, by F. G. Clapp and F. W. De Wolf. The sample consisted of 3 feet 4 inches of clear coal, representing the entire thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, p. 101.

For geologic relations see U. S. Geol. Survey Bull. 300, p. 100.

LONDON SCHOOL. MATCHETT COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1051 (p. 182).

Location.—Matchett country bank; Pittsburgh district; near London School. No railroad connection.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Measured and sampled July 11, 1904, by W. T. Griswold.

Section of coal bed in Matchett country bank, near London School.

Laboratory No.	1051	
	Ft.	*in.*
Roof, shale.		
Coal	0	11
Clay[a]	0	2½
Coal	1	9
Clay[a]	0	¼
Coal	0	4
Clay[a]	0	½
Coal	1	10
Thickness of bed	5	1¼
Thickness of coal sampled	4	10

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 273.

MANIFOLD. MANIFOLD MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1055 (p. 182).

Mine.—Manifold; Pittsburgh district; at Manifold, 1½ miles south of Meadowlands, on a branch of the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled on September 3, 1904, by F. G. Clapp and F. W. DeWolf, as shown below:

Section of coal bed in Manifold mine at Manifold.

Laboratory No.	1055	
	Ft.	*in.*
Coal[a]	2	6
Shale[a]	0	1
Coal[a]	0	2
Clay[a]	0	10
Coal	1	3
Binder	0	¼
Coal	1	3
Binder	0	¼
Coal	0	½
Binder	0	¼
Coal with thin binders	3	2
Thickness of bed	9	4¼
Thickness of coal sampled	5	9¼

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 181; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, pp. 92, 96.

MARIANNA. RACHEL AND AGNES MINES.

Sample.—Bituminous coal; Pittsburgh field; analyses Nos. 6858, 6859, 7432, 7459, 7460 (p. 182).

Mine.—Rachel and Agnes; Pittsburgh district; shaft mines 450 feet deep on the west side of Marianna (near Ellsworth), on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. The roof is 9 to 12 inches of "draw slate," and the floor is clay. The bed is about 6 feet thick at the points sampled.

The bed was measured and sampled by G. S. Pope on November 25, 1908, as described below:

Sections of coal bed in Rachel and Agnes mines at Marianna.

Laboratory No.	6858		6859	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	2	1	4¼
Sulphur streak	..	..	..	..
Slate	..	..	0	½
Coal	1	3	1	7¾
Slate	0	⅜	..	..
Bony coal	..	..	[a] 0	¾
Coal	0	5¼	[a] 0	½
Fire clay	[a] 0	¾	..	..
Bony coal	..	..	[a] 0	½
Coal	[a] 0	½	0	2½
Clay	[a] 0	⅝	..	..
Streak of sulphur	..	..	..	..
Coal	1	4¼	1	2
Bony coal	0	¾	0	¼
Coal	0	8¾	1	5¼
Bony coal	0	½	..	..
Coal	0	6¼	..	..
Floor, coal.				
Thickness of bed	5	9	6	¼
Thickness of coal sampled	5	7⅛	5	10½

[a] Not included in sample.

Sample 6858 was taken 900 feet southeast of airshaft, in first supply butt raise, air course.

Sample 6859 was taken 650 feet northwest of the Fulton shaft, in right dip loaded tracks.

Notes.—These mines in 1908 were considered as being among the largest and best equipped mines in the Pittsburgh region. Tipple was fitted to load slack, nut, and run-of-mine coal. The Rachel mine had an estimated daily output of 600 tons; it was expected to produce 1,000 tons daily.

The bed in the Agnes mine was also measured and sampled at three points by J. J. Rutledge, as shown below:

Sections of coal bed in Agnes mine at Marianna.

Laboratory No.	7432		7459		7460	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	11	2	11	2	11
"Bench" bone	[a] 0	2	[a] 0	2	..	..
Bone	..	..	..	..	0	1½
Coal	2	5	2	5	0	8
Bone	..	..	..	..	0	½
Coal	..	..	..	..	0	8
Bone	..	..	..	..	0	½
Coal	..	..	..	..	1	1
Thickness of bed	5	6	5	6	5	6½
Thickness of coal sampled	5	4	5	4	5	6½

[a] Not included in sample.

Sample 7432 was taken in last open crosscut between Blanche entries 1 and 2, 3,000 feet southwest of opening.

Sample 7459 was taken 1,800 feet north of opening.

Sample 7460 was taken 1,200 northeast of opening.

For chemical analyses of this coal see part I of this bulletin, p. 182.

MARIANNA. MARIANNA MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 7157 (p. 182).

Mine.—Marianna; Pittsburgh district; in Marianna, West Bethlehem township.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled by R. W. Ramsey, as shown below:

Section of coal bed in Marianna mine at Marianna.

Laboratory No.	7157	
	Ft.	*in.*
Draw slate [a]	1	3½
Coal	1	0
Binder	0	⅛
Coal	0	11
Binder	0	⅛
Coal	0	10
Parting (shale) [a]	0	2
Coal	2	8
Bony bottom coal [a]	0	2
Shale bottom (?).		
Thickness of bed	7	¾
Thickness of coal sampled	6	5¼

[a] Not included in sample.

The sample was taken in Blanche heading 1, left rib, close to face.

For chemical analyses of this coal see part I of this bulletin, p. 182.

MEADOWLANDS. MCLAIN MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1032 (p. 183).

Mine.—McLain; Pittsburgh district; 1 mile west of Meadowlands.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled on August 27, 1904, by F. G. Clapp and F. W. DeWolf, as shown below:

Section of coal bed in McLain mine, 1 mile west of Meadowlands.

Laboratory No.	1032	
	Ft.	*in.*
Roof, shale.		
Coal	0	4
Shale [a]	0	2
Coal	0	10½
Clay [a]	0	6
Coal	3	8
Thickness of bed	5	6½
Thickness of coal sampled	4	10½

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 182; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 272; Bull. 300, pp. 93, 96.

For geologic relations see U. S. Geol. Survey Bull. 300, p. 93.

MURDOCKSVILLE. OUTCROP.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1065 (p. 183).

Location.—Outcrop; on Bigger Run, in the Pittsburgh district, at Murdocksville.

Coal bed.—Ames. Carboniferous age, Conemaugh formation. Thickness, 2± feet.

The bed was measured and sampled on September 9, 1904, by W. T. Griswold, the sample representing the entire bed.

For chemical analyses of this coal see part I of this bulletin, p. 182.

For other mention of this sample see U. S. Geol. Survey Prof. Paper 48, pp. 112, 113, 273.

PARIS. FULTON'S COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1070 (p. 183).

Location.—Fulton's country bank; Pittsburgh district; at Paris. No railroad connection.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled on September 10, 1904, by W. T. Griswold, as shown below:

Section of coal bed in Fulton's country bank at Paris.

Laboratory No	1070	
	Ft.	*in.*
Coal	2	6
Parting [a]	0	½
Coal	2	2½
Thickness of bed	4	9
Thickness of coal sampled	4	8½

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 182; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 113, 273.

SODOM SCHOOL. MATCHETT'S COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1591 (p. 183).

Location.—Matchett's country bank; Pittsburgh district, near Sodom School.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness at this bank, 4 feet 6 inches.

The bed was measured and sampled by W. T. Griswold in 1904. The sample represented the entire thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 182; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 113, 273.

WARRIORS POINT. McCAUSLAND'S COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania special) analysis No. 1069 (p. 183).

Location.—McCausland's country bank; Pittsburgh district; at Warriors Point.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness, at this bank, 4 feet.

The bed was measured and sampled by W. T. Griswold on September 10, 1904. The sample represented the entire thickness of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 183; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 113, 273.

WESTLAND. MIDLAND NO. 3 MINE.

Sample.—Bituminous coal; Pittsburgh field; analysis No. 1590 (p. 183).

Mine.—Midland No. 3; in the Pittsburgh district; at Westland.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness at this mine 4 feet 6 inches.

The bed was measured and sampled by W. T. Griswold in 1904, as shown below:

Section of coal bed in Midland No. 3 mine at Westland.

Laboratory No	1590	
	Ft.	*in.*
Coal	1	2¼
Parting [a]	0	¾
Coal	3	3
Thickness of bed	4	6
Thickness of coal sampled	4	5¼

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p 183; also U. S. Geol. Survey Prof. Paper 48, pp. 112,-113, 273.

ZOLLARSVILLE. HORN'S COUNTRY BANK.

Sample.—Bituminous coal; Pittsburgh field; analyses, 1588, 1589 (p. 183).

Location.—Horn's country bank; at Zollarsville, in the Pittsburgh district. No railroad connection.

Coal bed.—Waynesburg. Carboniferous age, Monongahela formation. The bed was measured and sampled on October 15, 1904, by W. T. Griswold, as shown below:

Section of coal bed in Horn's country bank at Zollarsville.

Laboratory No.	1589	
	Ft.	*in.*
Coal [a]	1	10
Clay	0	7
Coal [b]	2	7
Thickness of bed	5	0

[a] Included in sample 1588.

[b] Included in sample 1589.

For chemical analyses of this coal see part I of this bulletin, p. 183; also U. S. Geol. Survey Prof. Paper 48, pp. 112, 113, 272; Bull. 300, pp. 110, 112.

WESTMORELAND COUNTY.

GREENSBURG. JAMISON NO. 2 MINE.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 4) analyses Nos. 1942, 1943 (p. 183).

Mine.—Jamison No. 2; a shaft mine in the Greensburg district, 4 miles north of Greensburg, on the Pennsylvania Railroad.

Coal bed.—Pittsburgh, which in this part of the county is a famous gas coal. Carboniferous age, Monongahela formation. The thickness is fairly uniform, averaging 7 feet at this mine. The bed lies nearly flat. The roof is a bluish shale. The floor is a bluish shale with clay below.

The bed was measured and sampled at two points by J. W. Groves on August 5, 1905, as shown below:

Sections of coal bed in Jamison No. 2 mine, 4 miles north of Greensburg.

Section	A		B	
Laboratory No.	1942		1943	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	4	1	4	4
Shale [a]	0	2	0	1
Coal	0	4	0	6
Mother coal	0	⅛	0	⅛
Coal	1	1	0	9
Shale	0	⅛	0	½
Coal	1	3	1	3
Floor, shale.				
Thickness of bed	6	11¼	6	11⅝
Thickness of coal sampled	6	9¼	6	10⅝

[a] Not included in sample.

Section A (sample 1942) was measured in room 19, off butt entry 10, 3,500 feet north of the shaft.

Section B (sample 1943) was measured in the main west entry, 2,000 feet northwest of the shaft.

Notes.—The coal from this mine, like that from others in this field, was used for gas making, and for steam production.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 167; Bureau of Mines Bull. 23, pp. 66, 176; producer-gas tests; U. S. Geol. Survey Bull. 290, p. 168; Bureau of Mines Bull. 13, pp. 184, 275.

For chemical analyses see part I of this bulletin, p. 183; also U. S. Geol. Survey Bull. 290, p. 167.

HERMINIE. KEYSTONE MINE.

Sample.—Bituminous coal; Pittsburgh field; (Pennsylvania No. 19) analyses Nos. 4352, 4351 (p. 183).

Mine.—Keystone; a shaft mine in the Greensburg district, ½ mile north of Herminie, on the Pennsylvania Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. It lies nearly flat, and at this mine averages 3 feet 7 inches. The roof is shale. The floor is a hard gray shale, regular, and good to shovel from. The cover is about 300 feet.

The bed was measured and sampled at two points in the mine by A. K. Adams and J. W. Groves on December 20, 1906, as shown below:

Sections of coal bed in Keystone mine at Herminie.

Section	A		B	
Laboratory No	4352		4351	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Clay	[a]1	0	[a]1	1
Coal	2	0	0	11
Coal, hard	0	½	..	..
Mother coal	..	..	0	¼
Coal	0	1¾	2	6
Mother coal	0	¼	0	½
Coal	0	6¾	0	5
Sulphur	[a]0	½	..	..
Shale	..	..	[a]0	1
Coal	0	9	[a]0	3½
Shale	[a]0	1	[a]0	1
Coal	[a]0	3½	0	3
Shale	[a]0	1	..	..
Mother coal	..	..	0	¼
Coal	1	8½	0	9
Bony coal	..	..	0	¼
Coal	..	..	1	3
Floor, shale.				
Thickness of bed	6	8¾	7	8¾
Thickness of coal sampled	5	2¾	6	2¼

[a] Not included in sample.

Section A (sample 4352) was measured in room 7, off west butt entry 1, 1,400 feet north of the shaft.

Section B (sample 4351) was measured 4,000 feet southeast of the shaft.

Notes.—The coal from this mine, like that from other mines in this field, is firm and breaks in cubical lumps. The output of the mine in December, 1906, was approximately 1,600 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 214; Bureau of Mines Bull. 23, pp. 67, 178, 179; briquetting tests: U. S. Geol. Survey Bull. 332, p. 215; coking tests: U. S. Geol. Survey Bull. 332, p. 215; Bull. 336, pp. 24, 32, 41.

For chemical analyses see part I of this bulletin, p. 183; also U. S. Geol. Survey Bull. 332, p. 214.

LIGONIER. LIGONIER MINE.

Sample.—Bituminous coal; Ligonier Valley field; (Pennsylvania No. 7) analyses Nos. 1994, 1995 (p. 184).

Mine.—Ligonier; a drift mine 3 miles north of Ligonier, on the Ligonier Valley Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. Thickness, fairly uniform, averaging, at this mine, about 7 feet 3 inches. The bed lies nearly flat. The roof left in mining is coal, the top shale above the coal not standing well.

The bed was measured and sampled at two points in the mine by J. W. Groves, J. S. Burrows, and W. J. von Borries on August 12, 1905, as shown on the following page.

Sections of coal bed in Ligonier mine, 3 miles north of Ligonier.

Section	A		B	
Laboratory No.	1994		1995	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Top coal (roof)	[a] 1	0	0	9
Coal	0	10	4	0
Shale	..	..	[a] 0	¼
Local bony coal	[a] 0	4½	..	..
Coal	2	2	[a] 0	1¾
Shale	..	..	[a] 0	½
Mother coal	0	¼	..	..
Coal	0	3	0	3
Shale	[a] 0	¾	..	..
Coal	2	8	..	..
Floor, clay.				
Thickness of bed	7	4½	5	2½
Thickness of coal sampled	5	11¼	5	0

[a] Not included in sample.

Section A (sample 1994) was measured in room 3, off left butt entry 4, 800 feet from the drift mouth.

Section B (sample 1995) was measured in room 3, off right entry 6, 950 feet from the drift mouth.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 176; Bull. 332, p. 194; Bureau of Mines Bull. 23, pp. 67, 177; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 177; Bureau of Mines Bull. 13, pp. 184, 275; washing tests: U. S. Geol. Survey Bull. 290, p. 178; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290; p. 178; Bull. 336, pp. 24, 31, 41; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 184; also U. S. Geol. Survey Bull. 290, p. 176; Bull. 332, p. 194.

SEWARD. SEWARD MINE.

Sample.—Semibituminous coal; Windber field; (Pennsylvania No. 20) analyses Nos. 4349, 4350 (p. 184).

Mine.—Seward; a drift mine 1½ miles east of Seward on the Pennsylvania Railroad.

Coal bed.—Lower Kittanning or B. Carboniferous age, Allegheny formation. It lies nearly flat and averages 3 feet 7 inches in thickness. The roof is a hard gray shale, as is the floor.

The bed was measured and sampled at two points in the mine by J. W. Groves and A. K. Adams on December 21, 1906, as shown below:

Sections of coal bed in Seward mine, 1½ miles southeast of Seward.

Section	A		B	
Laboratory No.	4349		4350	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bony coal [a]	0	2½	..	..
Coal	2	3	0	3
Sulphur	0	½	0	⅛
Coal	1	3	0	¾
Sulphur	..	..	0	⅛
Coal	..	..	0	10
Sulphur	..	..	0	⅛
Coal	..	..	2	3
Floor, shale.				
Thickness of bed	3	9	3	5⅛
Thickness of coal sampled	3	6½	3	5⅛

[a] Not included in sample.

Section A (sample 4349) was measured in room 32, off east flat entry 1, 1,850 feet south of the drift mouth.

Section B (sample 4350) was measured in room 8 on the water level entry, 1,050 feet southwest of the drift mouth.

Notes.—The coal from this mine, like that from some other mines in the district, is friable, and was shipped in run-of-mine form for steam production. The approximate output of the mine when sampled was 500 tons per day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 217; Bureau of Mines Bull. 23, pp. 67, 179; briquetting tests: U. S. Geol. Survey Bull. 332, p. 218; washing tests: U. S. Geol. Survey Bull. 332, p. 217; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 218; Bull. 336, pp. 24, 32, 41.

For chemical analyses see part I of this bulletin, p. 184; also U. S. Geol. Survey Bull. 332, p. 216.

RHODE ISLAND.

NEWPORT COUNTY.

PORTSMOUTH. PORTSMOUTH MINE.

Sample.—Anthracite coal; Narragansett basin; analyses Nos. 9328, 9329, 9330, 9331, 9335, 9336, 9337, 9338 (pp. 184–185).

Mine.—Portsmouth; a slope mine at Portsmouth on the New York, New Haven & Hartford Railroad.

Coal beds.—"Front," "Back," "Middle." The coal is of Carboniferous age, and is in the Aquidneck shales. Thickness of beds, 2 to 6 feet. Dip, variable, about 35° E.; roof, shale; floor, shale.

The beds were measured and sampled in 1909 by C. W. Brown, N. C. Dale, J. C. Martin, and C. A. Fisher, as described below:

Section of coal bed in Portsmouth mine (south slope) at Portsmouth.

Laboratory No.	9338	
	Ft.	*in.*
Roof, sandy shale.		
Coal, soft, foliated	0	2
Coal, hard, bright	1	2
Bone	0	2
Bone and coal in thin layers	0	2
Coal, hard, bright, prismatic jointing well developed	0	8
Coal, hard, with many bedding planes	2	8
Coal, soft, foliated	0	2
Floor, shale, very hard, uneven.		
Thickness of bed	5	2

Sample 9338 was taken by C. A. Fisher on 800-foot level, 1,200 feet south of main slope.

Sample 9328 was taken by C. W. Brown, 500 feet down vertically, 1,150 feet south of south slope, in the 900-foot gallery.

Sample 9329 was taken by C. W. Brown, 1,200 feet south of main slope, 500 feet down vertically, from breast at heading in gallery at 800-foot level, from the Middle, 6-foot, bed.

Sample 9330 was taken by N. C. Dale and J. C. Martin, 69 feet south of north shaft, at Marshall's landing, 150 feet down vertically, and represented a 27½-inch bed. The coal sampled had been long exposed.

Sample 9331 was taken by N. C. Dale and J. C. Martin, 900 feet north of north slope, at heading in gallery at Marshall's landing, 150 feet down vertically. The sample represented a 23-inch bed.

Sample 9335 was taken by C. A. Fisher from the Front bed, north slope, 324 feet south and 70 feet east of Marshall's landing, on main slope. The sample represented 2 feet of coal.

Sample 9336 was taken from Back bed by C. A. Fisher, from the south slope, 200 feet south of west end of crosscut leading from 600-foot level of main (Back) bed, or 200 feet south of Powell's corner. The sample represented a 4-foot 4½-inch cut, with a bone parting of 4½ inches 6 inches from the top.

Sample 9337 was taken by C. A. Fisher from the Middle bed, on 800-foot level, 250 feet south of main slope. It represented a 2-foot 1-inch cut containing many thin streaks of quartz that laid along the bedding and at varying angles to the bedding.

Notes.—This mine was first opened in 1808 and has been worked at intervals since then, the last attempt being in 1909–1912. The coal has been used for domestic purposes in the vicinity of the mine and from about 1867 to about 1882 was used for smelting copper ore at a smelter near the mine. Since 1897 several attempts have been made to market the coal in the form of briquets. The coal is a graphitic anthracite, and requires a strong draft for use in stoves. The ash has a tendency to form clinkers.

For results of producer-gas tests of this coal see Bureau of Mines Bull. 13, pp. 199, 275.

For chemical analyses see part I of this bulletin, pp. 184–185; also U. S. Geol. Survey Monograph XXXIII, p. 83.

For geologic relations see U. S. Geol. Survey Monograph XXXIII, p. 321.

PROVIDENCE COUNTY.

CRANSTON. OUTCROP.

Sample.—Anthracite coal; Narragansett basin; analyses Nos. 7769, 7770, 7771, 7772 (p. 185).

Location.—Outcrop at Cranston.

Coal bed.—The bed is of Carboniferous age and lies in the so-called Kingston series.

Notes.—This coal, like nearly all of that found in the Narragansett basin of Rhode Island and Massachusetts, is a graphitic anthracite. The presence of coal in the vicinity of Cranston has been known for many years and several attempts at mining have been made, but, owing to the character of the coal and its mode of occurrence, the total output has been small.

For chemical analyses of this coal see part I of this bulletin, p. 185; also U. S. Geol. Survey Monograph XXXIII, p. 161.

For geologic relations see U. S. Geol. Survey Monograph XXXIII, p. 161.

SOUTH DAKOTA.

CORSON COUNTY.

MORRISTOWN. SURFACE OUTCROP.

Sample.—Lignite; analysis No. 7840 (p. 185).

Location.—Surface outcrop; in the NW. ¼ sec. 19, T. 21 N., R. 21 E., 12 miles southeast of Morristown. No railroad connection.

Lignite bed.—No name. Cretaceous or Tertiary age; Lance formation. The bed was measured and sampled in 1909 by A. L. Beekly. The sample represented 2 feet 11 inches of clear coal, the thickness of the bed.

For chemical analysis of this lignite see part I of this bulletin, p. 185

HARDING COUNTY.

CAVE HILLS. OUTCROP.

Sample.—Lignite; analysis No. 2001 (p. 185).

Location.—Outcrop; Pete Riley's ranch in Cave Hills, sec. 19, T. 22 N., R. 6 E. No railroad connection.

Lignite bed.—No name. Tertiary age, Fort Union formation.

The bed was measured and sampled in 1905 by A. G. Leonard, as shown below:

Section of lignite bed in outcrop in Cave Hills.

Laboratory No.	2001	
	Ft.	*in.*
Lignite[a]	4	0
Lignite	5	0
Thickness of bed	9	0
Thickness of coal sampled	5	0

[a] Not included in sample.

For chemical analyses of this lignite see part I of this bulletin, p. 185; also U. S. Geol. Survey Bull. 285, p. 322.

TENNESSEE.

ANDERSON COUNTY.

Oliver Springs. Windrock No. 1 Mine.

Sample.—Bituminous coal; Brushy Mountain field; (Tennessee No. 4) analyses Nos. 2956, 2957 (p. 185).

Mine.—Windrock No. 1; a drift mine in the Oliver Springs district, 3 miles north of Oliver Springs on the Louisville & Nashville Railroad.

Coal bed.—Dean, locally called the Windrock. Carboniferous age, Pottsville group. The bed lies nearly flat, dipping northwest 8 inches in 100 feet and averages 4 feet 8 inches in thickness. The roof is a gray sandy shale. The floor is a hard clay. In parts of the mine the bed carries a sandy shale parting, which thickens to 2 feet as a maximum.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 19, 1906, as shown below:

Sections of coal bed in Windrock No. 1 mine, 3 miles north of Oliver Springs.

Section	A		B	
Laboratory No.	2957		2956	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	10	1	9
Mother coal	0	¼	0	¼
Coal	1	1	1	1
Shale	[a] 0	6	..	..
Cannel coal	..	..	0	1
Coal	2	9	1	6
Floor, fire clay.				
Thickness of bed	5	2¼	4	5¼
Thickness of coal sampled	4	8¼	4	5¼

[a] Not included in sample.

Section A (sample 2957) was measured in right entry 6, 2,000 feet south of the mine opening.

Section B (sample 2956) was measured in right butt entry 1, 1,300 feet northeast of the mine opening.

Notes.—The output of this mine in 1906 was shipped in two sizes—engine and lump. The capacity of the mine in 1906 was about 300 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 235; Bureau of Mines Bull. 23, pp. 67, 180; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 236; Bureau of Mines Bull. 13, pp. 202, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 237; coking tests: U. S. Geol. Survey Bull. 332, p. 236; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 237.

For chemical analyses see part I of this bulletin, p. 185: also U. S. Geol. Survey Bull. 332, p. 235.

CAMPBELL COUNTY.

GATLIFF. REGAL MINE.

Sample.—Bituminous coal; Brushy Mountain field; (Tennessee No. 3) analyses Nos. 2929, 2930 (p. 186).

Mine.—Regal, a drift and slope mine in the Jellico district, at Gatliff, on the Louisville & Nashville Railroad.

Coal bed.—Locally known as the Regal Block. Bed is of Carboniferous age, Pottsville group. The coal at this mine lies nearly flat, dipping 16 feet to the mile southeast, and averages 4 feet 6 inches in thickness. The roof is a hard sandy shale, 6 inches thick, that flakes off in layers 1 inch thick. Above this shale is a thick-bedded sandy shale. The floor is a hard fire clay about 18 inches thick, that is easy to shovel from. There are many local rolls in the bed, resulting in variations in amount and direction of dip. The coal carries a band about 8 inches thick called the mining bed. The bottom part of this band is in places a soft carbonaceous shale called rash.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 16, 1906, as shown below:

Sections of coal bed in Regal mine at Gatliff.

Section	A		B	
Laboratory No.	2929		2930	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	9	1	4
Rash	[a] 0	1½	[a] 0	1¼
Coal	3	4	3	½
Floor, clay.				
Thickness of bed	5	2½	4	5¾
Thickness of coal sampled	5	1	4	4½

[a] Not included in sample.

Section A (sample 2929) was measured in room 18, off entry 1, 500 feet south of the drift mouth.

Section B (sample 2930) was measured in room 30, off entry 3, 1,050 feet south of the mine mouth.

Notes.—The coal from this mine, like that from other mines working this bed in the same district, is easily mined with a pick. It stands transportation fairly well, and was generally sold as domestic fuel. The capacity of the mine in 1906 was about 600 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 232; Bureau of Mines Bull. 23, pp. 67, 180; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 233; Bull. 336, pp. 26, 33, 42; Bureau of Mines Bull. 13, pp. 202, 275; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 233.

For chemical analyses see part I of this bulletin, p. 186; also U. S. Geol. Survey Bull. 332, p. 232.

GATLIFF. WESTBORNE MINE.

Sample.—Bituminous coal; Brushy Mountain field; (Tennessee No. 2) analyses Nos. 2931, 2932 (p. 186).

Mine.—Westborne; a drift mine in the Jellico district, 2½ miles northeast of Gatliff, on the Louisville & Nashville Railroad.

Coal bed.—Locally known as the Log Mountain. Bed is of Carboniferous age, Pottsville group. At this mine it lies nearly flat, and averages 3 feet 6 inches in thickness. The roof is a hard gray laminated shale or "slate." The bed is clean coal, carrying no persistent shale partings. The floor is a layer of clay, 3 to 4 inches thick. Below this clay is hard sandstone.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 16, 1906, as shown below:

Sections of coal in Westborne mine, 2½ miles northeast of Gatliff.

Section	A	B
Laboratory No.	2932	2931
Roof: Section A, shale; section B, shale.	*Ft. in.*	*Ft. in.*
Coal	2 0	0 2½
Cannel coal	0 1½	.. ..
Shale	.. ..	[a] 0 ¼
Coal	1 5½	2 4
Cannel coal	.. ..	0 1
Coal	.. ..	1 ½
Floor, clay.		
Thickness of bed	3 7	3 8¼
Thickness of coal sampled	3 7	3 8

[a] Not included in sample.

Section A (sample 2932) was measured in right cross entry 1, 675 feet south of the mine opening.

Section B (sample 2931) was measured in the main entry, 687 feet northeast of the main opening.

Notes.—The coal from this mine is hard and dull black. It has a high specific gravity, and the appearance of cannel coal. It stands much handling, and was sold as a domestic fuel.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 229; Bureau of Mines Bull. 23, pp. 67, 180; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 230; Bureau of Mines Bull. 13, pp. 202, 275; coking tests: Bull. 332, p. 230; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 230.

For chemical analyses, see part I of this bulletin, p. 186; also U. S. Geol. Survey Bull. 332, p. 229.

LAFOLLETTE. REX NO. 2 MINE.

Sample.—Bituminous coal; Cumberland Gap field; (Ann Arbor No. 10) analyses Nos. 7497, 7498 (p. 186).

Mine.—Rex No. 2; Big Creek district, 1 mile northwest of Lafollette.

Coal bed.—Rex. The coal is of Carboniferous age, Briceville formation. The bed is from 3½ to 4 feet thick. Roof, "draw slate;" floor, "draw slate" with considerable good clay under the "slate."

The bed was measured and sampled by P. M. Riefkin on March 2, 1909, as described below:

Sections of coal bed in Rex No. 2 mine, 1½ miles northwest of Lafollette.

Laboratory No.	7497	7498
Roof, "draw slate."	*Ft. in.*	*Ft. in.*
Coal	2 9¼	1 2
Sulphur	0 ¼	0 3/16
Coal	1 1	0 ¼
Rash [a]	0 2	.. ..
Sulphur	.. ..	0 ⅛
Coal	.. ..	0 7¼
Mother coal	.. ..	0 ¼
Coal	.. ..	0 1¼
Sulphur	.. ..	0 ½
Coal	.. ..	1 6
Floor, "draw slate."		
Thickness of bed	4 ½	3 5 11/16
Thickness of coal sampled	3 10½	3 5 11/16

[a] Not included in sample.

Sample 7497 was taken 4,000 feet west of the opening, in right cross heading 6.

Sample 7498 was taken 4,200 feet northwest of the opening, in the cross heading.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 38, 47.

For chemical analyses, see part I of this bulletin, p. 186.

CLAIBORNE COUNTY.

FORK RIDGE. NO. 2 MINE.

Sample.—Bituminous coal; Cumberland Gap field; (Tennessee No. 1) analyses Nos. 2907, 2908, (p. 187).

Mine.—No. 2; a drift and slope mine at Fork Ridge, on the Louisville & Nashville Railroad.

Coal bed.—Mingo or Ralston of the Kentucky Geological Survey. Carboniferous age, Mingo formation. At this mine the bed dips to the southwest at a low angle and averages 4 feet 3 inches in thickness. The roof is a hard gray sandy shale. The floor is shale, like the roof. The cover is about 50 feet.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 12, 1906, as shown below:

Sections of coal bed in No. 2 mine, at Fork Ridge.

Section	A		B	
Laboratory No	2907		2908	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	4½	0	6
Mother coal	0	½	0	⅛
Coal	1	7	0	8
Shale [a]	0	2	..	..
Mother coal	..	..	0	¼
Coal and shale [a]	0	2½	..	..
Coal	1	7	0	9½
Shale [a]	..	..	0	2
Mother coal	0	¼	..	..
Shale and coal mixture [a]	..	..	0	3¼
Coal	0	5	0	5¼
Mother coal	..	..	0	½
Coal	..	..	0	10
Mother coal	..	..	0	¼
Coal	..	..	0	8
Floor, shale.				
Thickness of bed	4	4¾	4	5⅜
Thickness of coal sampled	4	¼	4	⅛

[a] Not included in sample.

Section A (sample 2907) was measured in room 5, off cross entry 3, 4,000 feet northeast of the slope.

Section B (sample 2908) was measured in the main entry, 4,400 feet east of the slope.

Notes.—The coal at this mine is very easily worked, all being taken down with a pick. It is very bright and shiny and seemingly contains little sulphur. The daily output of the mine when sampled was about 1,200 tons. The larger part of the production was shipped in run-of-mine form.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 225; Bureau of Mines Bull. 23, pp. 67, 179; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 226; Bureau of Mines Bull. 13, pp. 199, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 228; washing tests: U. S. Geol. Survey Bull. 332, p. 226; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 226; Bull. 336, pp. 24, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 227.

For chemical analyses, see part I of this bulletin, p. 187; also U. S. Geol. Survey Bull. 332, p. 225.

CUMBERLAND COUNTY.

WALDENSIA. YELLOW CREEK NO. 1 MINE.

Sample.—Bituminous coal; Walden field; (Tennessee No. 6) analyses Nos. 2977, 2978 (p. 187).

Mine.—Yellow Creek No. 1; a drift mine in the Rockwood district, 3 miles northwest of Waldensia, on the Southern Railway. The mine has been abandoned.

Coal bed.—Lower Sewanee (?). Carboniferous age, Walden formation. At this mine the bed averages 4 feet thick and dips about 10 feet in 100 feet to the southeast. The roof is a hard shale, as is the floor.

The bed was measured and sampled at two points in the mine by J. W. Groves on February 22, 1906. Sample 2978 represented 4 feet 6 inches of coal. Sample 2977 represented 3 feet 6 inches of coal.

Section A (sample 2978) was measured in room 1, off entry 2, 350 feet northeast of the drift mouth.

Section B (sample 2977) was measured in the west entry, 200 feet west of the drift mouth.

Note.—The estimated capacity of this mine in 1906 was 100 tons per day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 242; Bureau of Mines Bull. 23, pp. 68, 181; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 243; Bureau of Mines Bull. 13, pp. 202, 275; coking tests: U. S. Geol. Survey Bull. 332, p. 243; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 243.

For chemical analyses see part I of this bulletin, p. 187; also U. S. Geol. Survey Bull. 332, p. 242.

FENTRESS COUNTY.

WILDER. FENTRESS MINE.

Sample.—Bituminous coal; Cumberland Plateau field; (Tennessee No. 7) analyses Nos. 2979, 2980 (p. 187).

Mine.—Fentress; a drift mine at Wilder, on the Tennessee Central Railroad.

Coal bed.—Locally known as the Wilder. Carboniferous age, in the Lee formation. At this mine the bed has a general dip to the northeast, but the dip varies locally, owing to the many rolls and irregularities. The average thickness is 4 feet 4 inches. Roof, massive sandy shale; floor, sandy shale, containing streaks of coal. The bed contains "sulphur" in thin streaks and in bands 2 to 3 inches thick.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 23, 1906, as shown below:

Sections of coal bed in Fentress mine at Wilder.

Section	A		B	
Laboratory No	2979		2980	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	..	0	3
Mother coal	0	½	..	..
Sulphur [a]	..	..	0	¼
Coal	3	6	0	8
Sulphur	..	..	0	⅛
Coal	..	..	2	5
Sulphur [a]	..	..	0	1¼
Coal	..	..	0	6½
Floor, shale.				
Thickness of bed	4	6½	4	⅛
Thickness of coal sampled	4	6½	3	10⅝

[a] Not included in sample.

Section A (sample 2979) was measured in a crosscut off the main entry, 2,000 feet north of the drift opening.

Section B (sample 2980) was measured in room 28, off right entry 2, 1,500 feet east of the drift opening.

Note.—The capacity of this mine in 1906 was about 550 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 245; Bureau of Mines Bull. 23, pp. 68, 181; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 246; Bureau of Mines Bull. 13, pp. 204, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 247; washing tests: U. S. Geol. Survey Bull. 332, p. 246; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 246; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 247.

For chemical analyses see part I of this bulletin, p. 187; also U. S. Geol. Survey Bull. 332, p. 245.

WILDER. WILDER MINE.

Sample.—Bituminous coal; Cumberland Plateau field; analysis No. 1619 (p. 187).

Mine.—Wilder; at Wilder.

Coal bed.—Wilder; Carboniferous age; in the Lee formation. The bed is about 4 feet thick at point sampled.

The bed was sampled and measured in 1904 by J. S. Burrows, as described below:

Section of coal bed in Wilder mine at Wilder.

Laboratory No.	1619	
	Ft.	*in.*
Coal	0	7½
Sulphur	0	2½
Coal	2	3
Sulphur	0	¼
Coal	0	8½
Thickness of bed	3	9¾
Thickness of coal sampled	3	9¾

The sample was taken from room 1, off entry 3.

For chemical analyses of this coal see part I of this bulletin, p. 187.

GRUNDY COUNTY.

COALMONT. B MINE.

Sample.—Bituminous coal; Cumberland Plateau field; (Tennessee No. 9) analyses Nos. 2995, 2996 (p. 187).

Mine.—B, a drift mine in the Chattanooga district at Coalmont, on the Nashville, Chattanooga & St. Louis Railway.

Coal bed.—Sewanee, locally known as the Middle Sewanee. Carboniferous age, Walden formation. At this mine the bed averages 3 feet 4 inches thick. It lies nearly flat. The roof is sandstone in places, and in places gray shale. The floor is shale.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries, on March 2, 1906.

Section A (sample 2996) represented 3 feet 6 inches of coal.

Section B (sample 2995) represented 3 feet of coal.

Section A (sample 2996) was measured in left entry 6, 2,000 feet south of the mine opening.

Section B (sample 2995) was measured in right entry 4, 1,900 feet north of the mine opening.

In section A there is 1½ inches of rash or carbonaceous shale at the top and bottom of the coal, but these bands are not persistent.

Notes.—The coal from this mine, like that from other mines in the district working this bed, is soft and friable. At this mine the slack was washed and made into coke. The estimated capacity of the mine in 1906 was about 500 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 252; Bureau of Mines Bull. 23, pp. 68, 182; briquetting tests: U. S. Geol. Survey Bull. 332, p. 254; washing tests: U. S. Geol. Survey Bull. 332, p. 253; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 253; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 253.

For chemical analyses, see part I of this bulletin, p. 187; also U. S. Geol. Survey Bull. 332, p. 252.

MARION COUNTY.

ORME. BATTLE CREEK MINE.

Sample.—Bituminous coal; Cumberland Plateau field; (Tennessee No. 10) analyses Nos. 3009, 3010 (p. 188).

Mine.—Battle Creek, a drift mine 1 mile north of Orme, on the Nashville, Chattanooga & St. Louis Railway.

Coal bed.—Battle Creek. Carboniferous age, Pottsville group. It averages in thickness 5 feet 8 inches, but varies greatly, having a maximum thickness of 23 feet and pinching out entirely in places. The roof is a hard, sandy shale. The floor is much like the roof, but in places is more clayey. The bed carries partings of rash or carbonaceous shale.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries, on March 5, 1906, as shown below:

Sections of coal bed in Battle Creek mine, 1 mile north of Orme.

Section	A		B	
Laboratory No	3010		3009	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10	1	7
Rash	[a]0	2	[a]0	2
Coal	3	6	3	10
Rash	[a]0	2	..	..
Floor: section A, shale; section B, clay.				
Thickness of bed	5	8	5	7
Thickness of coal sampled	5	4	5	5

[a] Not included in sample.

Section A (sample 3010) was measured in west entry 14, 2,500 feet northwest of the drift mouth.

Section B (sample 3009) was measured in right heading 9, 2,200 feet northeast of the drift mouth.

Note.—The average output of this mine in 1906 was given as 500 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 255; Bureau of Mines Bull. 23, pp. 68, 182; briquetting tests: U. S. Geol. Survey Bull. 332, p. 256; washing tests: U. S. Geol. Survey Bull. 332, p. 256; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 256; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 67, 69, 71, 73, 75; Bull. 332, p. 256.

For chemical analyses see part I of this bulletin, p. 188; also U. S. Geol. Survey Bull. 332, p. 255.

MORGAN COUNTY.

PETROS. BIG BRUSHY NOS. 1 AND 2 MINES.

Sample.—Bituminous coal; Brushy Mountain field; (Tennessee No. 5) analyses Nos. 2958, 2959 (p. 188).

Mines.—Big Brushy Nos. 1 and 2; drift mines in the Morgan district, at Petros, on the Harriman & Northeastern Railroad.

Coal bed.—Brushy Mountain of the United States Geological Survey. Carboniferous age, Briceville formation. Bed lies nearly flat, dipping to the northeast about 30 feet to the mile, with higher local dips; thickness, about 2 feet 10 inches. It is generally clean, with the exception of partings of mother coal and occasional streaks of pyrite at the top. The roof varies from a hard shale to a very hard sandstone. The floor is a hard sandstone.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 20, 1906, as shown below:

Sections of coal bed in Big Brushy Nos. 1 and 2 mines at Petros.

Section	A		B	
Laboratory No.	2959		2958	
Roof, sec. A, sandstone; sec. B, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7	0	1
Mother coal	0	¼	..	..
Sulphur	..	..	0	⅛
Coal	0	9	0	6
Mother coal	0	¼	0	¼
Coal	0	4	2	½
Mother coal and shale	[a] 0	1½	..	..
Coal	1	2½	..	..
Floor, sandstone.				
Thickness of bed	3	½	2	7⅞
Thickness of coal sampled	2	11	2	7⅞

[a] Not included in sample.

Section A (sample 2959) was measured in the main entry, 3,800 feet east of the mine opening.

Section B (sample 2958) was measured in room 10, off right entry 9 in No. 2 mine, 2,500 feet southeast of the mine opening.

The mother coal and sulphur shown in this section are local.

Notes.—The coal shipped from this mine, like that from other mines working the same bed in this district, is rather soft, breaking into small lumps. It was shipped in run-of-mine form, and was used chiefly for steam production. The capacity of the mine in 1906 was about 750 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 239; Bureau of Mines Bull. 23, pp. 67, 68, 181; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 240; Bureau of Mines Bull. 13, pp. 202, 275; washing tests: U. S. Geol. Survey Bull. 332, p. 240; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 240; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 241.

For chemical analyses see part I of this bulletin, p. 188; also U. S. Geol. Survey Bull. 332, p. 239.

OVERTON COUNTY.

CRAWFORD. CRAWFORD MINE.

Sample.—Bituminous coal; Cumberland Plateau field; analysis No. 1617 (p. 188).
Mine.—Crawford, at Crawford.
Coal bed.—Wilder coal. Lee shale, Lower Pottsville age, Lee formation.
The bed is about 5 feet thick at point sampled.
The coal bed was sampled and measured in 1904 by J. S. Burrows as described below:

Section of coal bed in Crawford mine at Crawford.

Laboratory No.	1617	
	Ft.	*in.*
Coal	1	2
Sulphur	0	¼
Coal	1	4
Sulphur	0	¼
Coal	1	4
Sulphur	0	¾
Coal	1	0
Thickness of bed	4	11¼
Thickness of coal sampled	4	11¼

The sample was taken west of the mine 1,000 feet from the drift.
For chemical analyses of this coal see part I of this bulletin, p. 188.

WHITE COUNTY.

CLIFTY. CLIFTY NO. 1 MINE.

Sample.—Bituminous coal; Cumberland Plateau field; (Tennessee No. 8) analyses Nos. 3005, 3006 (p. 189).

Mine.—Clifty No. 1, a drift mine at Clifty, on the Nashville, Chattanooga & St. Louis Railway.

Coal bed.—Locally known as the Sewanee, but is probably the Bon Air. The bed lies nearly flat. Its average thickness at this mine is 3 feet 6 inches. The roof is sandstone. The floor is a hard fire clay. The bed is part of the Lee formation, of Carboniferous age.

The bed was measured and sampled at two points in the mine by J. W. Groves and W. J. von Borries on February 28, 1906, as shown below:

Sections of coal bed in Clifty No. 1 mine at Clifty.

Section	A		B	
Laboratory No.	3006		3005	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	0	1	..	..
Coal	1	0	0	11
Sulphur	0	⅛	0	⅛
Coal	1	5	0	2½
Sulphur [a]	0	½	[a] 0	¾
Coal	1	5	0	7
Sulphur	..	..	0	⅛
Coal	..	..	1	3½
Floor, fire clay.				
Thickness of bed	3	11⅝	3	1
Thickness of coal sampled	3	11⅛	3	¼

[a] Not included in sample.

Section A (sample 3006) was measured in the main entry, 1,900 feet north of the mine mouth.

Section B (sample 3005) was measured in room 7 of the west cross entry, 2,100 feet north of the mine mouth.

Note.—The estimated capacity of this mine in 1906 was about 500 tons daily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 249; Bureau of Mines Bull. 23, pp. 68, 182; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 249; Bureau of Mines Bull. 13, pp. 204, 207, 275; washing tests: U. S. Geol. Survey Bull. 332, p. 250; Bull. 336, p. 14; coking tests: U. S. Geol. Survey Bull. 332, p. 250; Bull. 336, pp. 25, 33, 42; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 66, 69, 71, 73, 75; Bull. 332, p. 251.

For chemical analyses see part I of this bulletin, p. 189; also U. S. Geol. Survey Bull. 332, p. 249.

TEXAS.

HOUSTON COUNTY.

CROCKETT. WOOTTER'S MINE.

Sample.—Lignite; Texas field; (Texas No. 1) analyses Nos. 1195, 1196 (p. 189).

Mine.—Wootter's, a shaft mine, at Wooters Station, 11 miles south of Crockett on the International & Great Northern Railroad.

Lignite bed.—The lignite beds at this place form part of the great lignite field that crosses the State. They are of Tertiary (Eocene) age, Wilcox(?) formation. The beds are irregular, and have not been specifically named. They occur interbedded with sand and clay. At Wooters Station the bed worked lies nearly horizontal, and is worked by a shaft 35 feet deep. The roof is lignite and clay. A peculiar feature of the bed is the occurrence of the pyrites, which is found in nearly vertical joints at 4 to 5 foot intervals.

Two samples were collected by M. R. Campbell on October 4, 1904.

Section A (sample 1195) was collected in room 17 off north entry 3, 890 feet from the mouth of the shaft, where the clean coal was 5 feet thick.

Section B (sample 1196) was taken in the main entry, 600 feet from the foot of the shaft, where the clean coal was 5 feet 8 inches thick.

Notes.—The lignite from this mine, like that from others in this field, slacks on exposure, and will not stand storage in the raw state. The rated capacity of the mine in 1904 was 300 tons per day. The larger part of the product was shipped to near-by points for steam production and domestic use. The lignite has given good results burned in a gas producer.

For results of tests of this lignite, see mention of specific tests as follows—steaming tests: Bureau of Mines Bull. 23, pp. 68, 183; producer-gas tests: U. S. Geol. Survey Bull. 261, p. 106; Bureau of Mines Bull. 13, pp. 207, 275.

For chemical analyses see part I of this bulletin, p. 189; also U. S. Geol. Survey Prof. Paper 48, p. 246; Bull. 261, p. 52.

MEDINA COUNTY.

LYTLE. CARR NO. 3 MINE.

Sample.—Bituminous coal; Texas field; (Pittsburgh No. 8) analyses Nos. 7330, 7331 (p. 189).

Mine.—Carr No. 3 mine, a shaft mine 2 miles southwest of Lytle, on the International & Great Northern Railroad.

Lignite bed.—The lignite is of Tertiary (Eocene) age, Wilcox(?) formation. The roof is sandy shale overlain with 8 inches of top coal; the floor is fire clay; cover, for the most part, 54 feet thick.

The bed was measured and sampled at two points by K. M. Way on February 4, 1909. as described below:

Sections of coal bed in Carr No. 3 mine, 2 miles southwest of Lytle.

Laboratory No.	7330		7331	
Roof, sandy shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	10	0	9½
Soft shale [a]	0	1	0	1
Coal	0	3¾	3	6
Floor, fire clay.				
Thickness of lignite bed	4	2¾	4	4½
Thickness of lignite sampled	4	1¾	4	3½

[a] Not included in sample.

Sample 7330 was taken in a room in the middle of northwest entry 5, 600 feet northwest of the opening.

Sample 7331 was taken in face of northeast entry 6, 350 feet northeast of the opening.

Note.—The daily capacity of the mine at time of sampling was 125 tons.

For results of briquetting tests of this lignite, see Bureau of Mines Bull. 14, pp. 25, 26.

For chemical analyses see part I of this bulletin, p. 189; also Bureau of Mines Bull. 14, p. 25.

MILAM COUNTY.

OLSEN. OLSEN MINE.

Sample.—Lignite; Texas field; (Texas No. 3) analyses Nos. 2562, 2563 (p. 189).

Mine.—Olsen, a shaft mine at Olsen, on the International & Great Northern Railroad.

Lignite bed.—Unnamed, one of many in the great Texas lignite area. It is of Tertiary (Eocene) age, Wilcox (?) formation. Its thickness averages at this mine about 7 feet. The dip is slight and to the east. The roof is a white shale, which is very tender and falls readily on exposure. In mining, about 1½ feet of coal is left for a roof. The floor is a soft shale, slightly laminated, and is not good to shovel from. The cover at this mine is about 65 feet.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on November 22, 1905.

Section A (sample 2562) represented 6 feet 5 inches of lignite and was measured in left entry 1, off the main entry, 400 feet east of the shaft.

Section B (sample 2563) represented 6 feet 7 inches of lignite, and was measured in room 3 on left entry 3, off the main entry, 500 feet east of the shaft.

Notes.—The lignite from this mine, like that from many others in this field, is tough and brown, readily slacks, and will not stand handling nor long shipment. The rated capacity of the mine in 1905 was 200 tons per day. The lignite was used chiefly for domestic purposes and for steam production at neighboring points.

For results of tests of this lignite see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 259; Bureau of Mines Bull. 13, pp. 209, 275.

For chemical analyses see part I of this bulletin, p. 189; also U. S. Geol. Survey Bull. 332, p. 259.

ROCKDALE. BIG LUMP MINE.

Sample.—Lignite; Texas field; (Pittsburgh No. 7) analyses Nos. 7270, 7271 (p. 189).

Mine.—Big Lump; a shaft mine 3½ miles northeast of Rockdale, on the International & Great Northern Railroad.

Lignite bed.—Big Vein. Tertiary (Eocene) age, Wilcox (?) formation. The roof is "black jack"; also the floor; cover about 45 feet thick.

The bed was measured and sampled at two points by K. M. Way on February 1, 1909.

Sample 7270 represented 6 feet 10 inches of lignite, and was taken in the face of entry 8, 1,020 feet northwest of the opening.

Sample 7271 represented 7 feet of lignite, and was taken in the face of entry 6, 720 feet north of the opening.

Note.—The daily capacity of the mine at time of sampling was 250 tons.

For results of briquetting tests of this lignite see Bureau of Mines Bull. 14, pp. 24–25.

For chemical analyses see part I of this bulletin, p. 189; also Bureau of Mines Bull. 14, p. 24.

ROBERTSON COUNTY.

CALVERT. CALVERT MINE.

Sample.—Bituminous coal; Texas field; (Pittsburgh No. 9) analyses Nos. 7403, 7404 (p. 190).

Mine.—Calvert, a shaft mine 6 miles west of Calvert, on the International & Great Northern Railroad.

Lignite bed.—Upper. Tertiary (Eocene) age, Wilcox formation. The roof is of clay; floor, clay.

The bed was measured and sampled at two points by K. M. Way on March 5, 1909, as described below:

Sections of lignite bed in Calvert mine, 6 miles west of Calvert.

Laboratory No.	7403		7404	
	Ft.	*in.*	*Ft.*	*in.*
Roof, bastard fire clay.				
Lignite	1	9½	2	6
Mother coal and shale	[a] 0	1¼	0	¼
Lignite	1	11	1	3¼
Shale	[a] 0	¾	[a] 0	4
Lignite	1	9½	1	6¾
Shale	[a] 0	2¼	[a] 0	1¼
Lignite	0	11	1	2
Floor, fire clay.				
Thickness of bed	6	9¼	6	11½
Thickness of lignite sampled	6	5	6	6¼

[a] Not included in sample.

Sample 7403 was taken in room 4, off south entry 1, 250 feet south of the opening.

Sample 7404 was taken in room 8, off east entry north, 550 feet northeast of the opening.

Note.—The rated capacity of the mine at time of sampling was 400 tons daily.

For results of briquetting tests of this lignite, see Bureau of Mines Bull. 14, pp. 28–30.

For chemical analyses see part I of this bulletin, p. 190; also Bureau of Mines Bull. 14, p. 29.

WOOD COUNTY.

HOYT. NOS. 1 AND 3 MINES.

Sample.—Lignite; Texas field; (Texas No. 2) analyses Nos. 1241, 1243, 2635, 2636 (p. 190).

Mine.—Nos. 1 and 3 mines; slope mines at Hoyt, on the Missouri, Kansas & Texas and the Texas Short Line Railroads.

Lignite bed.—This bed of lignite has not been identified at any other point, but is locally known as the C. L. It is of Eocene age, Wilcox formation. The lignite occurs about 45 feet below the surface; lies horizontal, but the floor rolls, and is reached by slopes. The bed is about 7 to 8 feet thick. It has a carbonaceous shale roof and a gray sandy clay floor. The bed is quite free from partings of any kind. In No. 3 mine the bed is slightly faulted in places. The cover is about 45 feet. Two sections of the bed were measured and sampled by M. R. Campbell on November 16, 1904. Section A (sample 1241) was measured in the south entry 2 in No. 1 mine, about 500 feet from the mouth of the mine, where the lignite was 8 feet 3 inches thick. Section B (sample 1243) was taken in the air course, near the foot of the air shaft in No. 3 mine, where the lignite was 7 feet 10 inches thick.

The bed was also sampled in the No. 3 mine by J. W. Groves and W. J. von Borries, on December 5, 1905.

Sample 2635 was taken in south entry 1, 1,100 feet southeast of the slope. Sample 2636 was taken in room 2, north entry 1, 400 feet northeast of slope.

Sample 2635 represented 6 feet 2 inches of lignite, and sample 2636 represented 8 feet 2 inches of lignite.

Notes.—The lignite from this mine, like that from others in the Texas lignite field, slacks on exposure, and will not stand storage in the raw state. It was used for domestic purposes and steam production at nearby points. It gave good results in a gas producer. Little slack was produced in mining, but in 1905 the lignite was loaded with forks, and all fine stuff, possibly 12 per cent, of the total shot down was left underground.

For results of tests of this lignite, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 260; Bureau of Mines Bull. 23, pp. 68, 183; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 261; Bureau of Mines Bull. 13, pp. 210, 275; briquetting tests: U. S. Geol. Survey Bull. 332, p. 261.

For chemical analyses, see part I of this bulletin, p. 190; also U. S. Geol. Survey Bull. 332, p. 260.

UTAH.

CARBON COUNTY.

Castlegate. Castlegate Mine.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 2097, 2098 (p. 190.)

Mine.—Castlegate; in Pleasant Valley district; in sec. 2, T. 13 S., R. 9 E., at Castlegate, on the Denver & Rio Grande Railroad.

Coal bed.—Castlegate. Cretaceous age; Mesaverde formation. Thickness, 4 to 10 feet; roof, sandstone; floor, sandstone.

The bed was measured and sampled by J. A. Taff in 1905.

Sample 2097 was taken from east part of mine, and represented a 10-foot cut.

Sample 2098 was taken from west part of mine, and represented a 6-foot cut.

Notes.—The coal from this mine, like that from other mines in this field, as a rule, is massive, clean, and low in sulphur. The floor is so uneven that mining machines could not be successfully used.

For chemical analyses of this coal, see part I of this bulletin, p. 190; also U. S. Geol. Survey Bull. 285, p. 294; Bull. 316, p. 351.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

Castlegate. Gibson Project.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 2193 (p. 191).

Location.—Gibson prospect; in sec. 3, T. 13 S., R. 11 E., 10 miles east of Castlegate, in Coal Creek Canyon.

Coal bed.—The bed is of Cretaceous age, Mesaverde formation.

The bed was measured and sampled by J. A. Taff in 1905. The sample taken represented a 5-foot cut of clean coal.

For chemical analyses of this coal, see part I of this bulletin, p. 191; also U. S. Geol. Survey Bull. 285, pp. 294, 296. For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

CASTLEGATE. BEAN PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 2188 (p. 191).

Location.—Bean prospect; in sec. 10, T. 13 S., R. 11 E., 10½ miles east of Castlegate, in Coal Creek Canyon.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled by J. A. Taff in 1905, as described below:

Section of coal bed in Bean prospect in Coal Creek Canyon.

Laboratory No.	2188	
	Ft.	*in.*
Coal	4	0
Shale [a]	0	1
Coal	4	1
Thickness of bed	8	2
Thickness of coal sampled	8	1

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 191.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

CLEAR CREEK. CLEAR CREEK MINE.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2542 (p. 191).

Mine.—Clear Creek; at Clear Creek in sec. 33, T. 13 S., R. 7 E.

Coal bed.—Clear Creek. Cretaceous age, Mesaverde formation. Bed almost horizontal. Thickness variable; in south part of mine 13 feet 5 inches of clean coal at time of sampling; in north part of mine bed in two benches separated by 16 feet of shale and only upper bench, 4 to 6 feet thick, worked.

The bed was measured and sampled in 1905 by J. A. Taff. The sample represented 13 feet 5 inches of clear coal.

The sample was taken in the mine, 3,000 feet from the entrance.

Notes.—The coal from this mine like that from other mines in this field is clean, massive, uniform in composition, and of low sulphur content. Slacks but little on exposure to weather.

For chemical analyses of this coal see part I of this bulletin, p. 191; also U. S. Geol. Bull. 285, pp. 294, 298.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

KENILWORTH. ABERDEEN MINE.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 10044, 10046 (p. 191).

Mine.—Aberdeen; at Kenilworth, four miles east of Helper.

Coal bed.—Book Cliffs (?). The coal is of Cretaceous age, Mesaverde formation. Thickness of bed, about 22 feet.

The bed was measured and sampled by R. Weiner. The sample was taken from three places: From main slope 1,880 feet north, from right slope 1,880 feet north, and fifth left slope 1,560 feet north by 132 feet west of mine mouth.

Sample 10046 represented the entire bed.

Sample 10044 represented cuts taken from different parts of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 191.

For geologic relations of coal bed see U. S. Geol. Survey Bull. 285, p. 293.

KENILWORTH. FOUR POINTS MINE.

Sample.—Bituminous coal; Book Cliffs field; (Denver No. 12) analyses Nos. 352–D, 353–D (p. 191).

Mine.—Four Points, a slope mine at Kenilworth, 4 miles east of Helper, on the Rio Grande Western Railroad.

Coal bed.—The bed worked is the lower of three beds, all of Cretaceous age, Mesaverde formation. Thickness at this mine about 20 feet, but only 13 feet are worked. The coal contains small bands of bone and scales of pyrites in small amount. The roof is shale, overlain with sandstone; the floor is sandstone.

The bed was measured and sampled at two points by J. W. Groves on February 6, 1908, as described below:

Sections of coal bed in Four Points mine at Kenilworth.

Section	A		B	
Laboratory No.	352-D		353-D	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	7	1	10
Bone	0	½	..	..
Bone and pyrites	..	..	a 0	1½
Coal	0	11	1	2
Bone	0	½	0	½
Coal	2	7	2	2
Shale and bone	0	1	..	..
Bone	..	..	a 0	1
Coal	2	7	a 0	2½
Bone	a 0	1¼	a 0	2
Coal	4	0	7	4
Shale	a 0	¾	..	..
Coal	1	0	..	..
Floor, sandstone.				
Thickness of bed	13	0	13	1½
Thickness of coal sampled	12	10	12	6½

a Not included in sample.

Section A (sample 352–D) was measured in room 1, off the back slope, 650 feet northwest of the opening.

Section B (sample 353–D) was measured in a room parallel to the second left entry, 1,100 feet northwest of the slope opening.

Notes.—The coal is brittle and has an irregular fracture. The commercial sizes produced in 1908 were run-of-mine, lump, egg, nut, and slack; 4-inch, 2½-inch, 2-inch, and 1¼-inch bar screens were used. The output of the mine when it was sampled was 500 tons per day.

For results of coking tests of this coal see U. S. Geol. Survey Bull. 332, pp. 47, 50.

For chemical analyses see part I of this bulletin, p. 191; also U. S. Geol. Survey Bull. 332, p. 22.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

KENILWORTH. ROYAL BLUE MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 10045 (p. 191).

Mine.—Royal Blue; at Kenilworth.

Coal bed.—The bed is of Cretaceous age; Mesaverde formation.

The sample represented a 96-inch cut. It was taken 582 feet north by 175 feet west of the mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 191.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

SUNNYSIDE. NO. 1 MINE.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 2189, 2192 (p. 191).

Mine.—No. 1; in sec. 32, T. 14 S., R. 14 E., near mouth of Whitmore Canyon at Sunnyside, on the Denver & Rio Grande Railroad.

Coal bed.—Upper. Cretaceous age; Mesaverde formation. Thickness, 70 inches.

The bed was measured and sampled in 1905 by C. D. Smith. The sample included a 70-inch cut.

Sample 2192 was a composite sample taken from the upper and lower beds of the Sunnyside mines.

For chemical analyses of this coal see part I of this bulletin, p. 191.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

SUNNYSIDE. PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 2190 (p. 191).

Location.—Prospect in Dugout Canyon, in the SE. ¼ NW. ¼ sec. 23, T. 13 S., R. 12 E., 12 miles northwest of Sunnyside. No railroad connection.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1905 by J. A. Taff, as shown below:

Section of coal bed in prospect, 12 miles northwest of Sunnyside.

Laboratory No.	2190	
	Ft.	*in.*
Coal	1	6
Bone	0	½
Coal	7	11½
Thickness of bed	9	6
Thickness of coal sampled	9	6

The coal was weathered.

Note.—Aside from the thin, bony parting shown above, the coal is massive and clean. The bed was not being worked.

For chemical analyses of this coal see part I of this bulletin, p. 191; also U. S. Geol. Bull. 285, p. 294.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

WINTERQUARTERS. NO. 1 MINE.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2541 (p. 191).

Mine.—No. 1; Pleasant Valley district; in the N. ½ sec. 7, T. 13 S., R. 7 E., on the Denver & Rio Grande Railway.

Coal bed.—Winterquarters. Cretaceous age; Mesaverde formation. Thickness varies, 9 to 16 feet; dip, 3° N.; roof, sandstone; floor, sandstone.

The bed was measured and sampled in 1905 by J. A. Taff. The sample represented 16 feet of clear coal.

The sample was taken in the southeastern part of the mine, 6,000 feet from the entrance.

Notes.—The coal is massive and generally clear of shaly impurities. The bed is cut by numerous dikes.

For chemical analyses of this coal, see part I of this bulletin, p. 191; also U. S. Geol. Survey Bull. 285, p. 294; Bull. 316, p. 357.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

EMERY COUNTY.

CLEAR CREEK. PROSPECT IN HUNTINGTON CANYON.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2410 (p. 192).

Location.—Prospect in Huntington Canyon; Pleasant Valley district; in S. ½ sec. 24, T. 16 S., R. 7 E., 5 miles southwest of Clear Creek. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1905 by J. A. Taff. The sample represented 9 feet 7 inches of clear coal.

Notes.—This coal, like most of that in the Book Cliffs field, is free from shaly impurities and is massive. It does not slack to any appreciable extent on exposure to weathering agents.

For chemical analyses of this coal, see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 285, p. 294; Bull. 316, p. 357.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

EMERY. EMERY MINE.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2386 (p. 192).

Mine.—Emery; a drift mine in the NE. ¼ SW. ¼ sec. 2, T. 23 S., R. 6 E., 6 miles southeast of Emery. No railroad connection.

Coal bed.—Emery. Cretaceous age, in the Mancos shale. Thickness, 5 feet; uniform; roof, shale; floor, shale; cover, 50 feet.

The bed was measured and sampled in 1905 by J. A. Taff. The sample represented 5 feet of clear coal.

The sample was taken in the mine, 50 feet from the entrance.

Notes.—This coal is imbedded in shale and adheres to the roof and floor so strongly that it is separated with difficulty in mining. The coal contains no shaly or bony partings and compares favorably in composition with coals of the Book Cliffs field.

For chemical analyses of this coal, see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 285, p. 294.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

HUNTINGTON. BEAR GULCH PROSPECT.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2409 (p. 192).

Location.—Bear Gulch prospect; Pleasant Valley district; in Bear Gulch, Huntington Canyon, in the NE. ¼ sec. 11, T. 14 S., R. 6 E., 7 miles northwest of Huntington. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. Roof, shale; floor, shale and sandstone.

The bed was measured and sampled in 1905 by J. A. Taff. The sample represented 10 feet 11 inches of coal.

Notes.—This coal is evenly good. In the thicker beds of this district the coal is generally massive and mines in somewhat uneven and often large blocks. Most of the coal has a bright luster and withstands long surface exposure without slacking. The coals of this district should be classed as high-grade bituminous. They are regarded as an excellent domestic and steaming fuel.

For chemical analyses of this coal, see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 285, p. 294; Bull. 316, p. 357.

For geologic relations, see U. S. Geol. Survey Bull. 285, p. 293.

MOUNT PLEASANT. LARSEN MINE.

Sample.—Bituminous coal; Wasatch Plateau field; analyses Nos. 2142, 2387 (p. 192).

Mine.—Larsen; Pleasant Valley district; in Huntington Canyon, in sec. 2, T. 15 S., R. 6 E., 12 miles east of Mount Pleasant. No railroad connection.

Coal bed.—Larsen. Cretaceous age, Mesaverde formation. Roof, sandstone; floor, sandstone.

Sample 2142 was taken in 1905 by G. B. Richardson. It represented 7½ feet of clear coal.

Sample 2387 was taken in 1905 by J. A. Taff. It represented 8 feet of clear coal, and was taken in the mine, 600 feet from the entrance.

Notes.—This coal is mined for domestic use and is essentially the same in quality as that from the Book Cliffs field.

For chemical analyses of this coal see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 285, p. 294; Bull. 316, p. 857.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

WOODSIDE. PETERSON'S PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3957 (p. 192).

Location.—Peterson's prospect; 4 miles east of Woodside.

Coal bed.—Not named. Cretaceous age, Mesaverde formation. The rocks dip low to the northeast.

The bed was measured and sampled by G. B. Richardson in the autumn of 1906, as shown below:

Section of coal bed in Peterson's prospect, 4 miles east of Woodside.

Laboratory No	3957	
	Ft.	in.
Bone[a]	1	2
Coal	4	0
Thickness of bed	5	2
Thickness of coal sampled	4	0

[a] Not included in sample.

The sample represented coal somewhat weathered.

Notes.—The coal from this prospect, like that from some mines in this field, breaks easily after mining. The lumps as mined range from 30 inches down, and there is a large amount of slack.

For chemical analyses of this coal see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 371, p. 45; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

WOODSIDE. PRENTISS PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analyses Nos. 4013, 4014 (p. 192).

Location.—Prentiss prospect, 13 miles north of Woodside and 8 miles south of Sunnyside (Carbon County) on branch of Denver & Rio Grande Railroad.

Coal bed.—The coal is of Cretaceous age, lower part of the Mesaverde formation. The strata dip low northeastward; roof, sandstone; floor, sandstone.

The bed was measured and sampled by G. B. Richardson on October 18, 1906, as described below:

Sections of coal bed in Prentiss prospect, 8 miles south of Sunnyside.

Laboratory No	4014		4013	
Roof, thin-bedded sandstone.	Ft.	in.	Ft.	in.
Coal[a]	2	4	..	..
Shale and sandstone[a]	3	0	..	..
Coal	6	0	6	0
Bone[a]	0	3	0	3
Coal	10	0	10	0
Floor, white sandstone.				
Thickness of bed	21	7	16	3
Thickness of coal sampled	16	0	16	0

[a] Not included in sample.

Sample 4014 was taken at the end of the prospect which was not being worked; the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 371, pp. 45, 46; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

WOODSIDE. PROSPECT IN HORSE CANYON.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 2200, (p. 192).

Location.—Prospect; in Horse Canyon in sec. 4 (?), T. 16 S., R. 14 E., 14 miles north of Woodside. No railroad connection.

Coal bed.—Horse Canyon. Cretaceous age, Mesaverde formation. Thickness, 14 feet 11 inches; roof, sandstone; floor, massive sandstone.

The bed was measured and sampled in 1905 by J. A. Taff, as shown below:

Section of coal bed in prospect, 14 miles north of Woodside.

Laboratory No	2200	
	Ft.	*in.*
Coal[a]	2	0
Shale and sandstone[a]	4	0
Coal	14	11
Floor, massive sandstone.		
Thickness of bed	20	11
Thickness of coal sampled	14	11

[a] Not included in sample.

Note.—This coal is clean and massive.

For chemical analyses of this coal see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 285, p. 294.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 293.

WOODSIDE. HORSE CANYON MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 4015 (p. 192).

Mine.—Horse Canyon; in sec. 4, T. 16 S., R. 14 E.; in Horse Canyon 14± miles north of Woodside, and 8± miles northeast of Verde.

Coal bed.—Lower. Cretaceous age, Mesaverde formation. The rocks dip low to the northeastward.

The bed was measured and sampled by G. B. Richardson in the autumn of 1906. The sample represented 13 feet 5 inches of coal.

The sample was taken 400 feet from the opening.

For chemical analyses of this coal see part I of this bulletin, p. 192; also U. S. Geol. Survey Bull. 371, p. 45, 46; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

GRAND COUNTY.

GREEN RIVER. BLACK BABY MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3945 (p. 193).

Mine.—Black Baby in sec. 23, T. 20 S., R. 17 E., Grand County, 10 miles northeast of Green River.

Coal bed.—No name. Cretaceous age, Mesaverde formation. The rocks dip to the northeast; roof, carbonaceous shale.

The bed was measured and sampled by G. B. Richardson in the autumn of 1906, as shown below:

Section of coal bed in Black Baby mine, 10 miles northeast of Green River.

Laboratory No	3945	
	Ft.	*in.*
Coal	0	3
Bone and shale[a]	0	3
Coal	2	3
Bone[a]	0	8
Coal	2	0
Bone and shale[a]	1	3
Coal	1	0
Thickness of bed	7	8
Thickness of coal sampled	5	6

[a] Not included in sample.

The sample was taken in west entry, 20 feet in.

Notes.—The coal from this mine, like that from other mines in this field, breaks easily after mining. The lumps range from 30 inches down, and there is a large amount of slack.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 371, p. 45; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

THOMPSONS. BALLARD MINE.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3856 (p. 193).

Mine.—Ballard; in T. 21 S., R. 20 E., 5 miles north of Thompsons.

Coal bed.—Intermediate. Cretaceous age, Mesaverde formation. The rocks lie almost flat; roof, shaly sandstone; floor, carbonaceous shale.

The bed was measured and sampled by G. R. Richardson in the summer of 1906, as shown below:

Section of coal bed in Ballard mine, 5 miles north of Thompsons.

Laboratory No	3856	
	Ft.	*in.*
Coal	1	3½
Bony coal	0	2¾
Coal	1	10½
Bony coal	0	1½
Coal	2	3
Thickness of bed	5	9¼
Thickness of coal sampled	5	9¼

Notes.—The coal from this mine, like that from other mines in this field, breaks easily after mining. The lumps range from 30 inches down, and there is a large amount of slack.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 371, p. 45; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

THOMPSONS. PROSPECT.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3857 (p. 193).

Location.—Prospect; 5 miles north of Thompsons, 75 feet above Ballard mine.

Coal bed.—Not named. Upper Cretaceous age, Mesaverde formation. The rocks lie almost flat; roof, shaly sandstone.

The bed was measured and sampled by G. B. Richardson in the summer of 1906. The sample represented 4 feet 6 inches of coal. It was taken in tunnel, 11 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 371, pp. 44–46; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

THOMPSONS. OUTCROP.

Sample.—Bituminous coal; Book Cliffs field; analysis No. 3854 (p. 193).

Location.—Outcrop; in Nash canyon, in T. 20 S., R. 21 E., 1½ miles northwest of Nash ranch and 8½ miles north of Thompsons.

Coal bed.—Cretaceous age, Mesaverde formation. The rocks dip low to the north.

The bed was measured and sampled by G. B. Richardson on September 22, 1906, as shown below:

Section of coal bed in outcrop 8½ miles north of Thompsons.

Laboratory No.	3854	
	Ft.	*in.*
Coal	1	3
Bone[a]	0	2
Coal	1	10½
Bone[a]	0	1½
Coal	2	3
Thickness of bed	5	8
Thickness of coal sampled	5	4½

[a] Not included in sample.

Note.—This coal has been little developed.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 371, p. 44; Bull. 316, p. 316.

For geologic relations see U. S. Geol. Survey Bull. 371, p. 11.

IRON COUNTY.

CEDAR CITY. CORRY MINE.

Sample.—Bituminous coal; Colob Plateau field; analyses Nos. 3761, 5494 (p. 193).

Mine.—Corry; a drift mine in the rim of Colob Plateau, in sec. 31, T. 36 S., R. 10 W., about 4 miles southeast of Cedar City, on the west side of Mount Henry, about 2,700 feet above the town.

Coal bed.—The bed is Cretaceous age; it is in the lower part of the Colorado group. The strata dip low northeastward. The bed lies nearly horizontal at an altitude of about 9,000 feet. Roof, carbonaceous and calcareous shale; floor, clay. The cover at this mine is about 500 feet thick.

The bed was measured and sampled by W. T. Lee on August 7, 1906, and by G. B. Richardson in the summer of 1907, as described below:

Sections of coal bed, 4 miles southeast of Cedar City.

Laboratory No.	3761		5494	
Roof: Lab. No. 3761, shale; Lab. No. 5494, limestone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, containing ½-inch streak of clay[a]	1	0	..	..
Clay[a]	0	1	..	..
Coal	0	5	3	3
Bone[a]	..	..	0	9
Clay[a]	0	1	..	..
Coal	2	0	2	4
Clay[a]	..	..	0	6
Coal	..	..	0	10
Floor: Lab. No. 3761, clay; Lab. No. 5494, limestone.				
Thickness of bed	3	7	7	8
Thickness of coal sampled	2	5	6	5

[a] Not included in sample.

Sample 3761 was taken about 50 feet from the outcrop.

Sample 5494 was taken at the end of the workings and represented fresh coal.

Notes.—The mine was opened in 1885 and had been worked occasionally since that time. The impurities in the coal vary greatly in quantity and character from place to place. The coal at time of sampling was used entirely for local consumption.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 316, p. 374; Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 360.

CEDAR CITY. WOOD AND TAYLOR MINE.

Sample.—Bituminous (coking) coal; Colob Plateau field; analysis No. 3760 (p. 193).

Mine.—Wood and Taylor; a drift mine in South Fork of Coal Creek Canyon, in the NW. ¼ sec. 4, T. 37 S., R. 10 W., 7 miles east of Cedar City.

Coal bed.—The coal is of Cretaceous age, Colorado group. The bed lies nearly horizontal at an altitude of about 8,900 feet, and is covered by nearly 1,000 feet of rock.

The bed was measured and sampled, 390 feet from the mouth of the opening, by W. T. Lee on September 6, 1906, as described below:

Section of coal bed in Wood and Taylor mine, 7 miles east of Cedar City.

Laboratory No.	3760	
Roof, limestone.	*Ft.*	*in.*
Coal, bony, discarded in mining [a]	2	0
Clay [a]	0	5
Coal [a]	0	10½
Shale, carbonaceous [a]	0	1
Coal [a]	0	6
Clay [a]	0	3½
Coal	2	1
Clay [a]	0	1
Coal	2	1
Floor, limestone.		
Thickness of bed	8	5
Thickness of coal sampled	4	2

[a] Not included in sample.

Notes.—In order to reach this mine an ascent of 2,000 feet or more must be made up the precipitous side of the canyon. The mine was opened in 1881 and had been worked more or less continuously since that time. The average output in 1906 was reported to be about 50 tons a year with a maximum of 250 tons. The coal was used entirely for local consumption. Coke is said to have been made from this coal many years ago, having been used for the extraction of iron and other ores.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 316, p. 374.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 360.

CEDAR CITY. JONES MINE.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 5304 (p. 193).

Mine.—Jones; in the NW. ¼ sec. 36, T. 36 S., R. 10 W., on Coal Creek, 7 miles southeast of Cedar City.

Coal bed.—No name. The coal occurs in strata of Colorado age (Cretaceous). The rocks dip low to the northeastward; roof, limestone; floor, limestone; cover, 100 feet.

The bed was sampled by G. B. Richardson in the summer of 1907, as shown below:

Section of coal bed in Jones mine, 7 miles southeast of Cedar City.

Laboratory No.	5304	
	Ft.	*in.*
Coal	1	10
Bony coal [a]	0	2½
Coal	2	7
Thickness of bed	4	7½
Thickness of coal sampled	4	5

[a] Not included in sample.

The sample was taken 100 feet from the entrance of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 381.

CEDAR CITY. JONES AND BULLOCK MINE.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 3762 (p. 193).

Mine.—Jones and Bullock mine; a drift mine in Coal Creek Canyon, in the SE. ¼ sec. 36, T. 36 S., R. 10 W., about 8 miles southeast of Cedar City, at an altitude of 7,200 feet.

Coal bed.—The coal is of Cretaceous age, Colorado group. The bed lies nearly horizontal. The entry is driven into the side of the canyon on the coal bed. The cover at this mine is many hundreds of feet thick.

The bed was measured and sampled by W. T. Lee on September 8, 1906, as described below:

Section of coal bed in Jones and Bullock mine, 8 miles southeast of Cedar City.

Laboratory No.	3762	
	Ft.	*in.*
Coal, impure [a]	1	0
Clay [a]	0	8½
Coal	3	10½
Thickness of bed	5	7
Thickness of coal sampled	3	10½

[a] Not included in sample.

Notes.—The mine is located near the wagon road between Cedar City and Panguitch. It had been operated more or less continuously since 1890, with a maximum output of about 300 tons a year. The entry in 1906 had been run on the bed 250 feet. The coal was used entirely for local consumption.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 316, p. 374.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 360.

KANARRAVILLE. KANARRAVILLE MINE.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 3830 (p. 193).

Mine.—Kanarraville; a drift mine near the top of Colob Plateau, in sec. 28, T. 37 S., R. 11 W., 4 miles northeast of Kanarraville.

Coal bed.—The coal is of Cretaceous age, Colorado group. The bed lies nearly horizontal at an altitude of about 8,500 feet. The thickness is uniform; dip, about 5° E. The cover at this mine is several hundred feet thick.

The bed was measured and sampled 270 feet from the mouth of the mine, by W. T. Lee on September 10, 1906, as described below:

Section of coal bed in Kanarraville mine, 4 miles northeast of Kanarraville.

Laboratory No.	3830	
Roof, clay and earthy limestone.	*Ft.*	*in.*
Coal	1	9
Clay [a]	0	4
Coal [a]	0	2
Clay [a]	0	2
Coal	3	6
Clay [a]	0	1
Coal	1	11
Limestone, earthy [a]	0	5
Floor, coal.		
Thickness of bed	8	4
Thickness of coal sampled	7	2

[a] Not included in sample.

The sample was taken in mine, 270 feet in.

Notes.—The mine is best reached from Kanarraville by a public road leading to the plateau. The mine was first opened in 1886. In 1906, at time of sampling, little coal was mined, probably because of the difficulties of cartage. About 80 tons was said to be the average yearly output. The coal was used entirely for local consumption.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 316, p. 374.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 360.

KANARRAVILLE. KANARRA MINE.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 5307 (p. 193).

Mine.—Kanarra; a drift mine, in the NW. ¼ sec. 33, T. 37 S., R. 11 W., 5 miles east of Kanarraville.

Coal bed.—The coal occurs in strata of Colorado (Cretaceous age). The rocks dip low to the northeastward.

The bed was sampled by G. B. Richardson in the summer of 1907. The sample represented 8 feet 9 inches of coal.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 381.

KANARRAVILLE. CULVER MINE.

Sample.—Bituminous coal; Colob field; analyses Nos. 3687, 5305, (p. 193).

Mine.—Culver; a drift mine at the western rim of Colob Plateau, in Shirts Canyon, 6 miles northeast of Kanarraville, and about 7 miles south of Cedar City, in the NW. ¼ sec. 24, T. 37 S., R. 11 W., at an altitude of 8,000 feet.

Coal bed.—Cretaceous age, Colorado group. The bed is of uniform thickness; dip, about 8° SE.; roof, shale; floor, limestone; cover, at this mine, about 900 feet.

The bed was measured and sampled by W. T. Lee on August 28, 1906, and by G. B. Richardson in the summer of 1907, as shown below:

Sections of coal bed in Culver mine, 6 miles northeast of Kanarraville.

Laboratory No.	3687		5305	
Roof, carbonaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	3	2	3
Clay	[a] 0	2	..	..
Bony coal	..	..	[a] 0	2
Coal	4	4	4	11
Limestone, earthy	[a] 2	0	..	..
Clay	..	..	[a] 0	7
Coal	[a] 2	0	0	9
Floor, limestone.				
Thickness of bed	10	9	8	8
Thickness of coal sampled	6	7	7	11

[a] Not included in sample.

Sample 3687 was taken 125 feet from the mouth of the opening.

Notes.—In 1906, the mine was most conveniently reached from Cedar City by a wagon road that had been built up Shirts Canyon. The mine was first opened in 1903, when an entry was run on the coal bed about 175 feet. Nothing more was done until the summer of 1906, when work was begun with the intention of active operation, although no coal had been shipped at the time the mine was examined.

For chemical analyses of this coal see part I of this bulletin, p. 193; also U. S. Geol. Survey Bull. 316, p. 374; Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 374.

NEW HARMONY. NEW HARMONY MINES.

Sample.—Semibituminous to anthracite coal; Harmony field; analyses Nos. 3793, 3794, 5309, 5310, 5311, 5312 (p. 194).

Mines.—New Harmony; drift-slope mines, about 4 miles northwest of New Harmony, in sec. 32, T. 27 S., R. 13 W. No railroad connection.

Coal beds.—No. 3, No. 4, and No. 6. Cretaceous age, in the Colorado group. The coal beds are faulted and warped, but in general dip steeply toward the east. The tilt is the result of the intrusion of a mass of andesite.

The beds were measured and sampled by W. T. Lee on September 12, 1906, as described below:

Section of coal beds in the New Harmony mines, 4 miles northwest of New Harmony.

Laboratory No.	3793, 3794	
Roof, sandstone.	*Ft.*	*in.*
Coal (analysis No. 3793)	4	5
Shale, sandstone and limestone	27	0
Coal (analysis No. 3794)	4	8
Floor, shale.		
Thickness of beds	36	1

Samples 3793 and 3794 were taken at an altitude of 6,200 feet.

The beds were also measured and sampled by G. B. Richardson in the summer of 1907.

Sample 5309 represented 4 feet 8 inches of coal taken from the No. 3 bed in entry No. 3 at an altitude of 6,000 ± feet.

Sample 5310 was also taken in entry No. 3 from the No. 3 bed. It was a picked sample.

Sample 5311 represented 4 feet of coal. It was taken in entry No. 4 from the No. 6 bed.

Sample 5312 represented 4 feet 4 inches of coal. It was taken in entry No. 3, from the No. 4 bed, at an altitude of 6,000 ± feet.

Note.—The coal is crushed and the beds vary greatly in thickness within short distances.

For chemical analyses of this coal see part I of this bulletin, p. 194; also U. S. Geol. Survey Bull. 316, p. 334; Bull. 341, p. 388.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 372.

KANE COUNTY.

Glendale. Glendale Mine.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 5341 (p. 194).

Mine.—Glendale; in the NW. ¼ sec. 24, T. 40 S., R. 7 W., ½ mile northeast of Glendale.

Coal bed.—Not named. The coal occurs in strata of Colorado (Cretaceous) age. The rocks dip low to the northeastward; roof, shale; floor, shale.

The bed was sampled by G. B. Richardson in the summer of 1907, as shown below:

Section of coal bed in Glendale mine, ½ mile east of Glendale.

Laboratory No.	5341	
	Ft.	*in.*
Coal	3	2
Bony coal[a]	0	3
Coal	4	0
Thickness of bed	7	5
Thickness of coal sampled	7	2

[a] Not included in sample.

Notes.—The Colob coals are deep black and have a shiny luster. They are intrinsically of medium low grade. The high sulphur content renders these coals undesirable for metallurgical fuel.

For chemical analyses of this coal see part I of this bulletin, p. 194; also U. S. Geol. Survey Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 381.

GLENDALE. CANNEL KING PROSPECT.

Sample.—Bituminous, cannel coal; Colob Plateau field; analyses Nos. 5313, 5306, and 5308 (p. 194).

Location.—Cannel King prospect; on North Fork of Virgin River, in the NE. ¼ sec. 26, T. 39 S., R. 9 W., 13 miles northwest of Glendale.

Coal bed.—The coal occurs in strata of Cretaceous age, Colorado formation. The rocks dip low to the northeastward.

The bed was measured and sampled at three points in the summer of 1907 by G. B. Richardson, as shown below:

Section of coal bed in Cannel King prospect, 13 miles northwest of Glendale.

Laboratory No	5306, 5308, 5313
	Ft. in.
Roof, carbonaceous shale.	
Coal, bituminous	2 5
Coal, cannel	5 6
Floor, shale.	
Thickness of bed	7 11

Sample 5313 was taken at the face and represented weathered coal, 2 feet 5 inches thick, from the bituminous coal bed.

Sample 5306 was taken from the cannel coal, 5 feet 6 inches thick, and represented the upper 2 feet.

Sample 5308 was taken from the cannel coal, 5 feet 6 inches thick, and represented the lower 3½ feet.

Note.—The extent of the cannel coal had not been determined at the time the mine was visited.

For chemical analyses of this coal see part I of this bulletin, p. 194; also U. S. Geol. Survey Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 381.

ORDERVILLE. KROFT MINE.

Sample.—Bituminous coal; Colob Plateau field; analysis No. 5314 (p. 194).

Mine.—Kroft; in the NW. ¼ sec. 16, T. 41 S., R. 7 W., 1 mile east of Mount Carmel and 2 miles south of Orderville.

Coal bed.—Not named. The coal occurs in strata of Cretaceous age, in the Colorado group. The rocks dip low, to the northeastward.

The bed was sampled by G. B. Richardson in the summer of 1907, as shown below:

Section of coal bed in Kroft mine, 2 miles south of Orderville.

Laboratory No	5314
	Ft. in.
Coal	4 2
Parting[a]	0 4
Coal	3 4
Parting[a]	0 ½
Coal	1 8
Thickness of bed	9 6½
Thickness of coal sampled	9 2

[a] Not included in sample.

Notes.—The sample probably represented slightly weathered coal. Like other coals from this field, this coal is intrinsically of medium low grade. The high sulphur content renders it an undesirable metallurgical fuel.

For chemical analyses of this coal see part I of this bulletin, p. 194; also U. S. Geol. Survey Bull. 341, p. 397.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 381.

SANPETE COUNTY.

STERLING. MORRISON MINE.

Sample.—Bituminous coal; Wasatch Plateau field; analysis No. 2141 (p. 195).

Mine.—Morrison; at Six Mile Creek, in sec. 35, T. 18 S., R. 2 E., 2 miles east of Sterling.

Coal bed.—Sterling. The coal occurs in a fault block at the base of the Wasatch Plateau, and probably is in the Mesaverde formation (Upper Cretaceous age). The rocks dip east 15 to 20 degrees.

The bed was sampled by G. B. Richardson during the summer of 1905. The sample represented 2 feet 8 inches of coal.

Notes.—This is a bituminous coal having a somewhat high amount of volatile combustible matter, and therefore a low fuel ratio. The percentage of moisture is high and the sulphur is low. At the mine it was reported that the coal would not coke.

For chemical analyses of this coal see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 285, p. 284.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 280.

WALES. WALES MINE.

Sample.—Bituminous coal; Sanpete Valley field; analysis No. 2143 (p. 195).

Mine.—Wales; in sec. 26, T. 15 S., R. 2 E., in New Canyon, 2 miles west of Wales.

Coal bed.—Wales. The coal occurs near the base of the local Eocene section (Wasatch?). The rocks lie almost flat.

The bed was sampled by G. B. Richardson during the summer of 1905, as shown below:

Section of coal bed in Wales mine, 2 miles west of Wales.

Laboratory No.	2143
Roof, limestone.	*Ft. in.*
Coal	0 10
Bone	0 2½
Coal	0 4
Bone	0 1
Coal	0 4
Bone	0 2½
Coal	0 1
Bone	0 1
Coal	0 10
Floor, limestone.	
Thickness of bed	3 0

Notes.—This coal is too thin and bony to make it very valuable, yet it is used locally for domestic purposes. It has a local reputation for blacksmith's purposes.

For chemical analyses of this coal see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 285, p. 283.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 280.

SUMMIT COUNTY.

COALVILLE. WASATCH MINE.

Sample.—Subbituminous coal; Weber River field; analyses Nos. 3200, 3201 (Utah No. 2) and analyses Nos. 2408, 8064, 8065 (p. 195).

Mine.—Wasatch, a slope mine in the Coalville district, sec. 3, T. 2 N., R. 5 E., 3 miles northeast of Coalville, on the Union Pacific Railroad.

Coal bed.—Locally known as the Ten Foot, the Coalville, and the Grass Creek; also Wasatch bed. Cretaceous age, Colorado (?) formation. The bed at this mine has an average thickness of 10 feet and a dip of 19 degrees. The roof is gray sandstone. The floor is clay, with "black rash" (carbonaceous shale) beneath. The cover is about 300 feet at the foot of the slope.

The bed was measured and sampled at two points by J. W. Groves on May 1, 1906, as shown below:

Sections of coal bed in Wasatch mine, 3 miles northeast of Coalville.

Section	A		B	
Laboratory No.	3200		3201	
Roof, gray sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	10	2	0	10
Sandstone [a]	..	..	0	¼
Coal	..	..	9	9
Floor, clay.				
Thickness of bed	10	2	10	7¼
Thickness of coal sampled	10	2	10	7

[a] Not included in sample.

Section A (sample 3200) was measured in a room on the 500-foot level, 5,000 feet east of the slope opening.

Section B (sample 3201) was measured in a room on the 400-foot level, 4,500 feet east of the slope opening.

The Wasatch bed was also measured and sampled in 1905 by Joseph A. Taff. The sample (No. 2408) represented 9 feet of clear coal. It was taken 100 feet from the entrance to the mine.

The bed was also measured and sampled at two points by J. W. Groves.

Sample 8064 was taken 1,800 feet north of slope, and represented 10 feet 3 inches of coal.

Sample 8065 was taken 1,200 feet southwest of slope, and represented a 9¾-foot cut.

Notes.—The coal from this mine, like that from many other mines in the district, makes considerable slack in mining and preparation. It was used for domestic purposes and by railroads for locomotive fuel.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 265; Bureau of Mines Bull. 23, pp. 68, 183; briquetting tests: U. S. Geol. Survey Bull. 332, p. 265.

For chemical analyses see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 332, p. 265; Bull. 285, pp. 285, 287.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 285.

UINTA COUNTY.

Vernal. Gibson Mine.

Sample.—Bituminous coal; Vernal field; analyses Nos. 5515, 5517, 5518 (p. 195).

Mine.—Gibson; a slope mine 3 miles north of Vernal in the NE. ¼ NW. ¼ sec. 2, T. 4 S., R. 21 E. No railroad connection.

Coal bed.—No name. Cretaceous age, Mancos shale. Roof, massive sandstone; floor, not exposed.

The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in Gibson mine, 3 miles north of Vernal.

	Ft.	*in.*
Coal	1	10
Coal	3	6½
Clay	0	1
Coal	1	9
Thickness of bed	7	2½

Sample 5515 included the lower 14 inches of the top 22-inch bench.

Sample 5517 included the middle bench.

Sample 5518 included the lower bench.

The samples were taken in the mine 120 feet from the entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 341, p. 315; Bull. 415, pp. 214, 250, 252.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 306.

VERNAL. C. C. RICH MINE.

Sample.—Bituminous coal; Vernal field; analyses Nos. 5510, 5513 (p. 195).

Mine.—C. C. Rich; 5 miles northwest of Vernal in lots 1 and 2, NW. ¼ sec. 11, T. 4 S., R. 20 E. No railroad connection.

Coal bed.—No name. Cretaceous age, Mancos shale. Dip, 12° SW.; roof, white sandstone.

The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in C. C. Rich mine, 5 miles northwest of Vernal.

	Ft.	*in.*
Coal [a]	1	6½
Bone	0	10
Coal [a]	0	9
Bone	0	4½
Coal [b]	0	9
Bone	0	4
Coal [b]	0	4
Thickness of bed	4	11

[a] Included in sample 5510.

[b] Included in sample 5513.

The samples were taken in the mine 1,300 feet from the entrance.

Notes.—This coal, like that from other mines in this field, has a relatively high percentage of ash; the abundance of bony material in the bed is the chief disadvantage and interferes rather seriously with economic mining.

For chemical analyses of this coal see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 341, pp. 309, 315; Bull. 415, pp. 207, 250, 252.

For geologic relations see U. S. Geol. Survey Bull. 415, p. 204.

VERNAL. JOE RICH MINE.

Sample.—Bituminous coal; Vernal field; analyses Nos. 5509, 5512 (p. 195).

Mine.—Joe Rich; 7 miles northwest of Vernal, in the NW. ¼ SW. ¼ sec. 2, T. 4 S., R. 20 E. No railroad connection.

Coal bed.—No name. Cretaceous age, Mancos shale. Dip, 11½° N.; roof, solid, massive, white sandstone.

The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in Joe Rich mine, 7 miles northwest of Vernal.

	Ft.	*in.*
Coal [a]	2	3
Bone	0	9
Coal [a]	0	9½
Bone	0	5½
Coal [b]	0	11
Bone	0	3½
Coal [b]	0	6½
Thickness of bed	6	0

[a] Included in sample 5509.

[b] Included in sample 5512.

The samples were taken in the mine 1,200 feet from the entrance.

Sample 5509 represents upper two benches, marketed as first-grade coal.

Sample 5512 represents lower two benches, marketed as second-grade coal.

For chemical analyses of this coal see part I of this bulletin, p. 195; also U. S. Geol. Survey Bull. 341, pp. 309, 315; Bull. 415, pp. 207, 250, 252.

For geologic relations see U. S. Geol. Survey Bull. 415, p. 204.

VERNAL. TIMOTHY MINE.

Sample.—Bituminous coal; Vernal field; analyses Nos. 5754, 5755 (p. 196).

Mine.—Timothy; in lot 10, SW. ¼ sec. 2, T. 4 S., R. 20 E., 5½ miles northwest of Vernal. No railroad connection.

Coal bed.—No name. Cretaceous age; Mancos shale. Dip, 11°; roof, solid, massive white sandstone; floor, bone.

The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in Timothy mine, 5 miles northwest of Vernal.

	Ft.	*in.*
Coal [a]	1	11½
Bone	0	8½
Coal [a]	0	10
Bone	0	3½
Coal [b]	0	11½
Bone	0	5½
Coal [b]	0	6
Thickness of bed	5	8½

[a] Included in sample 5755. [b] Included in sample 5754.

For chemical analyses of this coal see part I of this bulletin, p. 196; also U. S. Geol. Survey Bull. 341, pp. 309, 315; Bull. 415, pp. 207, 216, 250, 252.

For geologic relations see U. S. Geol. Survey Bull. 415, p. 204.

VERNAL. GRAY MINE.

Sample.—Bituminous coal; Vernal field; analyses Nos. 5511, 5753 (p. 196).

Mine.—Gray; 6 miles northwest of Vernal in the NE. ¼ SE. ¼ sec. 3, T. 4 S., R. 20 E. No railroad connection.

Coal bed.—No name. Cretaceous age, Mancos shale. Dip, 14° S.; roof, solid, massive white sandstone.

The bed was measured and sampled in 1907 by H. S. Gale, as shown below:

Section of coal bed in Gray mine, 6 miles southwest of Vernal.

	Ft.	*in.*
Coal [a]	1	10½
Bone	0	11
Coal [a]	0	7
Bone	0	7½
Coal [a]	0	10½
Bone	0	2
Coal [b]	0	6½
Thickness of bed	5	7

[a] Included in samples 5511 and 5753. [b] Included in sample 5511 only.

The samples were taken in the mine, 200 feet from the entrance.

Notes.—The coal at this mine, as at some other mines in this field, was separated into two grades, and marketed for domestic use.

For chemical analyses of this coal see part I of this bulletin, p. 196; also U. S. Geol. Survey Bull. 341, pp. 309, 314; Bull. 415, pp. 207, 217, 250, 252.

For geologic relations see U. S. Geol. Survey Bull. 415, p. 204.

VIRGINIA.

DICKENSON COUNTY.

CLINTWOOD. CHASE & DAMRON MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 3827 (p. 196).

Mine.—Chase & Damron; ¼ mile south of Clintwood, and 20 miles from the nearest railroad at Coeburn.

Coal bed.—Clintwood. Carboniferous age, at the base of the Wise formation.

The bed was measured and sampled by C. W. Dodge under the direction of R. W. Stone on September 21, 1906, as shown below:

Section of coal bed in Chase & Damron mine, ¼ mile south of Clintwood.

Laboratory No	3827	
Roof, shale.	*Ft.*	*in.*
Clay [a]	0	1
Coal	4	4
Pyrite [a]	0	2
Coal [a]	1	9
Floor, shale.		
Thickness of bed	6	4
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken at the face of a drift about 150 feet from the entry and represents the upper bench, 4 feet 4 inches thick. The lower bench is left for a floor.

For chemical analyses of this coal see part I of this bulletin, p. 196; also U. S. Geol. Survey Bull. 348, p. 119.

For geologic relations see U. S. Geol. Survey Bull. 348, p. 11.

LEE COUNTY.

CRAB ORCHARD. MORRIS PROSPECT.

Sample.—Bituminous coal; Black Mountain field; (Virginia No. 1) analyses Nos. 2246, 2268, 2269 (p. 196).

Location.—Morris prospect, near Crab Orchard, about 7 miles from the Louisville & Nashville Railroad.

Coal bed.—Locally known as the Wilson. Carboniferous age, in the Pottsville group. It is about 8 feet thick, and lies nearly flat. The roof is a slaty shale. The floor is clay.

The bed was measured and sampled by J. S. Burrows, J. W. Groves, and W. J. von Borries, on September 30, 1905, as shown below:

Section of coal bed in Morris prospect near Crab Orchard.

Section	A	
Laboratory No	2246	
Roof, shale.	*Ft.*	*in.*
Coal [a]	0	¾
Coal	1	5
Mother coal	0	¼
Coal	1	3
Shale, carbonaceous	0	½
Coal	3	0
Shale [a]	0	½
Coal [a]	0	1¼
Clay [a]	1	½
Coal	0	7
Mother coal	0	½
Coal	0	9
Floor, clay.		
Thickness of bed	8	4¼
Thickness of coal sampled	7	1¼

[a] Not included in sample.

Sample 2246 represented the upper and lower benches and was measured 29 feet 3 inches in from the exposed outcrop in the left rib of the bank. The coal had been exposed for some time, the sample being taken for the purpose of noting the effect of weathering on the coal.

Two other samples, taken to show the effect of weathering, were collected by J. W. Groves and W. J. von Borries on October 5, 1905, at points in the opening showing sections as below:

Sections of coal bed in Morris prospect near Crab Orchard.

Section	C		D	
Laboratory No	2268		2269	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a]0	11	0	11
Mother coal	[a]0	½	0	½
Coal	[a]0	8	0	8
Mother coal	[a]0	¼	0	¼
Coal	[a]3	2	3	2
Clay	[a]1	0	[a]1	0
Coal	0	6	[a]0	6
Shale	0	¼	[a]0	¼
Coal	0	11	[a]0	11
Floor, clay.				
Thickness of bed	7	3	7	3
Thickness of coal sampled	1	5¼	4	9¾

[a] Not included in sample.

Section C (sample 2268) was measured at face 16 feet in from the outcrop. The coal was not quite solid and was very wet.

Section D (sample 2269) was measured 21 feet in from the outcrop. The coal at this point was less weathered than in section C, but the vein of the bed was not as firm as in section B.

Notes.—This was a new opening, from which coal had not been shipped in a commercial way. It was proposed to locate ovens convenient to the opening and convert much of the output into coke.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 187; Bureau of Mines Bull. 23, pp. 68, 183; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 188; Bureau of Mines Bull. 13, pp. 211, 276; coking tests: U. S. Geol. Survey Bull. 290. p. 189; Bull. 336, pp. 25, 33, 43; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 54, 55, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 196; also U. S. Geol. Survey Bull. 290, p. 186.

CRAB ORCHARD. BIG OPENING PROSPECT.

Sample.—Bituminous coal; Black Mountain field; (Virginia No. 2) analyses Nos. 2248, 2249 (p. 197).

Location.—Prospect near the "big opening" on the Wilson farm, near Crab Orchard, about 7 miles from the Louisville & Nashville Railroad.

Coal bed.—Locally known as the McConnell. Carboniferous age, in the Pottsville group. Thickness, about 6 feet; dip, slight; roof, sandstone; floor, clay.

The bed was measured and sampled at one point, 72 feet in from the outcrop, by J. W. Groves and W. J. von Borries on October 2, 1905, as shown on the following page.

Sections of coal bed in prospect near Crab Orchard.

Laboratory No.	2248, 2249	
Roof, sandstone.	*Ft.*	*in.*
Coal (streaks mother coal)	1	6
Mother coal	0	¼
Coal	0	6
Mother coal	0	⅛
Hard coal	0	9
Mother coal	0	¼
Coal	0	6
Mother coal	0	¼
Coal	0	10
Shale and mother coal	0	¼
Coal	0	2
Mother coal	0	⅛
Coal	0	9½
Clay	0	1
Coal	1	0
Floor, fire clay.		
Thickness of bed	6	2¾

Sample 2249 was taken from the lower bench shown in the section; that is, from the bottom coal 1 foot thick.

Sample 2248 represented a 61¾-inch cut. It was taken from the coal above the fire-clay parting over the bench included in sample 2248. Sample 2248 was very wet.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 190; Bureau of Mines Bull. 23, pp. 68, 183, 184; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 192; Bureau of Mines Bull. 13, pp. 211, 276; washing tests: U. S. Geol. Survey Bull. 290, p. 192; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 193; Bull. 336, pp. 25, 34, 43; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 55, 57, 60, 63.

For chemical analyses see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 290, p. 190.

DARBY. DARBY MINE.

Sample.—Bituminous coal; Black Mountain field; (Virginia No. 4) analyses Nos. 2323, 2324 (p. 197).

Mine.—Darby, a drift mine at Darby, on the Louisville & Nashville Railroad.

Coal bed.—Locally known as the Darby. Carboniferous age, Pottsville group. The thickness at the mine averages about 3 feet, and the coal is very regular. The roof is a sandy shale. The floor is the same.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on October 10, 1905, as shown below:

Sections of coal bed in Darby mine, at Darby.

Section	A		B	
Laboratory No.	2323		2324	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Draw slate[a]	0	5	0	9
Coal	1	0	1	0
Mother coal	0	¼	0	¼
Coal	2	1	1	8
Floor, shale.				
Thickness of bed	3	6¼	3	5¼
Thickness of coal sampled	3	1¼	2	8¼

[a] Not included in sample.

Section A (sample 2323) was measured in room 18, off butt entry 1, 1,423 feet from the mine opening.

Section B (sample 2324) was measured in room 1, off butt entry 3, 901 feet from the mine opening.

For results of tests of this coal, see mention of specific tests as follows: Steaming tests: U. S. Geol. Survey Bull. 290, p. 197; Bureau of Mines Bull. 23, pp. 68, 69, 184; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 198; Bureau of Mines Bull. 13, pp. 211, 276; coking tests: U. S. Geol. Survey Bull. 290, p. 199; Bull. 336, pp. 25, 34, 43; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 55, 57, 61, 63.

For chemical analyses see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 290, p. 196.

Darbyville. Black Mountain Mine.

Sample.—Bituminous coal; Black Mountain field; analysis No. 6236 (p. 197).

Mine.—Black Mountain; Pocket district; Darbyville, on Bailey Trace. It is reached by the Louisville & Nashville Railroad from Pennington station and also by a branch of the Southern Railway from Appalachia.

Coal bed.—No. 5 (locally known as the Darby). It is said to be the stratigraphic equivalent of the Taggart coal of the Big Stone Gap district. Carboniferous age, Pottsville group. The bed is from 3 to 4 feet in thickness and is overlain by sandstone and underlain by clay. Is clean and free from partings.

The bed was measured and sampled 100 feet from the entrance by C. A. Fisher in 1908. The sample represented 3 feet 6 inches of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 341, p. 147.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 411.

Darbyville. Gin Creek Opening.

Sample.—Bituminous coal, Black Mountain field; analysis No. 6238 (p. 197).

Location.—Gin Creek opening; Pocket district; on the slopes of Little Black Mountain, near Darbyville. This district is just north of Pennington Gap and is reached by the Louisville & Nashville Railroad from Pennington station and also by a branch of the Southern Railway from Appalachia.

Coal bed.—No. 9. Carboniferous age, Pottsville group. The bed is about 5 feet thick and in some localities contains a thin parting in the lower half. The bed is overlain and underlain with shale.

The bed was measured and sampled by C. A. Fisher in June, 1908, as shown below:

Section of coal bed in Gin Creek opening near Darbyville.

Laboratory No	6238	
Roof shale.	*Ft.*	*in.*
Coal	3	5
Bone[a]	0	1½
Coal	1	3½
Floor, shale.		
Thickness of bed	4	10
Thickness of coal sampled	4	8½

[a] Not included in sample.

Notes.—This bed was reported not to have been mined in this district. The coal has not been observed to be crumbly; it has a metallic impact and is moderately heavy. In burning it leaves a relatively small amount of ash, which is reddish yellow in color and moderately fine. Little sulphur is in the coal, but mineral charcoal is fairly abundant.

For chemical analyses of this coal see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 341, p. 417.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 411.

Darbyville. Gin Creek Prospect.

Sample.—Bituminous coal; Black Mountain field; analysis No. 6237 (p. 197).

Location.—Prospect; Pocket district; head of Left Fork of Gin Creek, near Darbyville, and just north of Pennington Gap, reached by a branch of the Louisville

& Nashville Railroad from Pennington station and also by a branch of the Southern Railway from Appalachia.

Coal bed.—No. 10. Carboniferous age, Pottsville group. The bed is about 6 feet thick with a clay parting in the upper part, also a thin coaly shale layer about 2 feet above the base.

The bed was measured and sampled by C. A. Fisher in June, 1908, as shown below:

Section of coal bed 10 in Gin Creek prospect near Darbyville.

Laboratory No	6237
	Ft. in.
Coal	1 0
Clay [a]	0 4
Coal	2 8
Shale, coaly [a]	0 1
Coal	2 1
Thickness of bed	6 2
Thickness of coal sampled	5 9

[a] Not included in sample.

Notes.—The coal has been observed to be crumbly. Very little sulphur is present in the coal, but mineral charcoal is fairly abundant.

For chemical analyses of this coal see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 341, p. 417.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 411.

Darbyville. Gin Creek Prospect.

Sample.—Bituminous coal; Black Mountain field; analysis No. 6239 (p. 197).

Location.—Prospect; Pocket district; at head of Left Fork of Gin Creek, on the slopes of Little Black Mountain, near Darbyville.

Coal bed.—No. 12. Carboniferous age, Pottsville group. The bed is 4 to 5 feet thick, with a massive Harlan sandstone roof and clay floor.

The bed was measured and sampled by C. A. Fisher in 1908, as shown below:

Section of coal bed in Gin Creek prospect near Darbyville.

Laboratory No	6239
Roof, Harlan sandstone.	*Ft. in.*
Coal	0 6
Shale, carbonaceous [a]	0 4½
Coal	4 0
Floor, clay.	
Thickness of bed	4 10½
Thickness of coal sampled	4 6

[a] Not included in sample.

Notes.—This is the highest workable bed in the district. As it is the highest coal on the slopes of Little Black Mountain it has the smallest distribution of all the beds within the district. In 1908 it had been opened at a number of places, but like all beds above No. 6, it had not been mined in the Pocket district. The coal is very firm and finely laminated, and in some respects resembles a splint coal. It also breaks in blocks and appears to resist weathering better than some of the other coals.

For chemical analyses of this coal see part I of this bulletin, p. 197; also U. S. Geol. Survey Bull. 341, p. 417.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 411.

MONTGOMERY COUNTY.

Blacksburg. Poverty Mine.

Sample.—Semianthracite coal; Brush Mountain field; (Virginia No. 5) analyses Nos. 4092, 4093 (p. 197).

Mine.—Poverty, a drift mine 10 miles west of Blacksburg.

Coal bed.—Locally known as the Big Seam of the Brush Mountain field. Carboniferous (Mississippian) age, Pocono formation. The bed averages 7 feet 8 inches in thickness. The roof is sandstone. The floor is hard shale.

The bed was measured and sampled at two points by K. M. Way on October 31, 1906, as shown below:

Sections of coal bed in Poverty mine, 10 miles west of Blacksburg.

Section	A		B	
Laboratory No.	4092		4093	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Coal	0	11½	0	11
Shale	[a] 0	2	[a] 0	1¾
Coal	0	3½	0	3¼
Shale	[a] 0	4	[a] 0	4¼
Coal	[a] 0	4½	[a] 0	2
Shale	[a] 0	½	[a] 0	2¼
Coal	1	3	0	11½
Sandstone	[a] 0	8	[a] 0	6¼
Coal	2	0	[a] 0	2
Shale	[a] 0	4½	..	..
Sandstone	..	..	[a] 0	6¾
Coal	0	4	1	6½
Shale	[a] 0	2	[a] 0	4¼
Coal	0	2½	0	5
Shale	[a] 0	1	[a] 0	1
Coal	0	9	0	1½
Shale	..	..	[a] 0	1
Coal	..	..	0	8½
Floor, shale.				
Thickness of bed	8	0	7	6¾
Thickness of coal sampled	5	9½	4	11¼

[a] Not included in sample.

Section A (sample 4092) was measured in the face of south entry 1, 750 feet south of the drift mouth.

Section B (sample 4093) was measured in the face of south entry 1, 765 feet from the drift mouth, 15 feet from section A.

Notes.—The coal from this mine, like that from other mines in the field, is hard and firm. The approximate output of the mine in 1906 was about 4 tons per day, the opening being in process of development.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 267; Bureau of Mines Bull. 23, pp. 69, 184; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 268; Bureau of Mines Bull. 13, pp. 212, 276; briquetting tests: U. S. Geol. Survey Bull. 332, p. 268.

For chemical analyses see part I of this bulletin, p. 197.

For geologic relations see U. S. Geol. Survey Bull. 332, p. 267.

RUSSELL COUNTY.

DANTE. LOWER BANNER NO. 2 MINE.

Sample.—Bituminous (coking) coal; Russell Fork field; analysis No. 4057 (p. 198).

Mine.—Lower Banner No. 2; at Dante, on the Carolina, Clinchfield & Ohio Railway.

Coal bed.—Lower Banner. Carboniferous age, Norton formation. Roof, shale, a few inches, overlain with sandstone.

The bed was measured and sampled by R. W. Stone in October, 1906, as shown below:

Section of coal bed in Lower Banner No. 2 mine.

Laboratory No.	4057	
	Ft.	*in.*
Roof, shale.		
Coal	1	7
Laminated coal	0	3
Coal, solid	1	5
Clay [a]	0	6
Coal [a]	0	2
Thickness of bed	3	11
Thickness of coal measured	3	3

[a] Not included in sample.

The sample was taken from a freshly dressed face in room 4 off the left entry.

For chemical analyses of this coal see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 316, p. 74; Bull. 348, p. 119.

For geologic relations see U. S. Geol. Survey Bull. 348, p. 11.

DANTE. KENNEDY NO. 4 MINE.

Sample.—Bituminous (coking) coal; Dante field; analysis No. 3947 (p. 198).

Mine.—Kennedy No. 4; at Dante, on the Carolina, Clinchfield & Ohio Railway.

Coal bed.—Widow Kennedy. Carboniferous age, Norton formation. The bed has a roof of "draw slate" overlain with sandstone, and has a sandstone floor.

The bed was measured and sampled by R. W. Stone on October 4, 1906. The sample represented the whole bed, being taken from a 3¾-foot cut from a fresh face in cross heading 2, about 300 yards from entry.

For chemical analyses of this coal, see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 316, p. 74; Bull. 348, p. 119.

For geologic relations, see U. S. Geol. Survey Bull. 348, p. 11.

DANTE. UPPER BANNER NO. 3 MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 3942 (p. 198).

Mine.—Upper Banner No. 3; 1 mile south of Dante, on the Carolina, Clinchfield & Ohio Railway.

Coal bed.—Upper Banner. Carboniferous age, Norton formation. The bed was measured and sampled by R. W. Stone on October 4, 1906, as shown below:

Section of coal bed in Upper Banner No. 3 mine, 1 mile south of Dante.

Laboratory No.	3942	
Roof, draw slate.	*Ft.*	*in.*
Coal	1	10
Sandstone [a]	0	1
Coal	0	10
Shale	0	½
Coal	2	5
Floor, shale.		
Thickness of bed	5	2½
Thickness of coal sampled	5	1½

[a] Not included in sample.

The sample was taken from butt entry 6, off main entry, from a fresh working face in mine.

Note.—This coal is high-grade, coking, bituminous coal.

For chemical analyses of this coal, see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 316, p. 74; Bull. 348, p. 119.

For geologic relations see U. S. Geol. Survey Bull. 348, p. 11.

DANTE. CLINCHFIELD MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 10385 (p. 198).

Mine.—Clinchfield, ½ mile east of Dante, on the Carolina, Clinchfield & Ohio Railway.

Coal bed.—Lower Banner. Carboniferous age, Norton formation.

The bed was measured and sampled on April 30, 1910, by E. G. Woodruff. The sample represented 2 feet 4 inches of coal. It was taken in the main entry, 150 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 198.

Dante. No. 3 Mine.

Sample.—Bituminous coal; Russell Fork field; analysis No. 10387 (p. 198).

Mine.—No. 3; 1 mile east of Dante, on the Carolina, Clinchfield & Ohio Railway.

Coal bed.—Upper Banner. Carboniferous age, Norton formation.

The bed was measured and sampled on April 30, 1910, by E. G. Woodruff, as shown below:

Section of coal bed in No. 3 mine, 1 mile east of Dante.

Laboratory No.	10387	
	Ft.	*in.*
Coal	0	2½
Parting[a]	0	2
Coal	1	6
Sandstone[a]	0	1
Coal	1	2½
Parting[a]	0	1
Coal	1	11½
Thickness of bed	5	2½
Thickness of coal sampled	4	10½

[a] Excluded from sample.

The sample was taken in right entry 4, 1,000 feet from the mouth of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 198.

SCOTT COUNTY.

Adamar. Hagan Mine.

Sample.—Bituminous (cannel) coal; Powell Mountain field; analysis No. 10359 (p. 198).

Mine.—Hagan, on McGee Creek, 1 mile north of Adamar. No railroad connection.

Coal bed.—The coal is of Carboniferous (Mississippian) age, Pennington shale.

The bed was measured and sampled on April 24, 1910, by M. R. Campbell and E. G. Woodruff, as shown below:

Section of coal bed in Hagan mine, 1 mile north of Adamar.

Laboratory No.	10359	
	Ft.	*in.*
Coal, cannel	1	10½
Coal, bony	0	5
Coal, cannel	1	2
Coal, bony	0	4
Coal, cannel and bituminous	0	6½
Thickness of bed	4	4
Thickness of coal sampled	4	4

The sample was taken in the mine about 50 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 431, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 148.

Ka. Milner Prospect.

Sample.—Bituminous coal; Powell Mountain field; analysis No. 10358 (p. 198).

Location.—Milner prospect of Patrick Hagan on Stony Creek, 5 miles from Ka. No railroad connection.

Coal bed.—Milner. Carboniferous age, Lee conglomerate.

The bed was measured and sampled April 22, 1910, by M. R. Campbell. It was 5 feet 4½ inches thick where sampled, about 500 feet from entrance. The normal measurement is less than 30 inches, and the great thickness where sampled is due to squeezing when the strata were upturned in Stone Mountain.

For chemical analyses see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 431, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 148.

KA. HAGAN PROSPECT.

Sample.—Bituminous coal; Powell Mountain field; analysis No. 10361 (p. 198).

Location.—Hagan prospect on Coalpit branch of Stony Creek, 1½ miles above Ka. No railroad connection.

Coal bed.—Duncan. Carboniferous age, Lee conglomerate.

The bed was measured and sampled April 22, 1910, by M. R. Campbell and E. G. Woodruff, as shown below:

Section of coal bed in Hagan's Prospect, 1½ miles above Ka.

Laboratory No	10361	
	Ft.	*in.*
Coal	1	4½
Bone [a]	0	¾
Coal	1	1½
Thickness of bed	2	6¾
Thickness of coal sampled	2	6

[a] Not included in sample.

The sample was taken in the main entry, about 125 feet from the entrance.

For chemical analyses see part I of this bulletin, p. 198; also U. S. Geol. Survey Bull. 431, p. 161.

For geologic relations see U. S. Geol. Survey Bull. 431, p. 148.

TAZEWELL COUNTY.

BOISSEVAIN. BOISSEVAIN MINE.

Sample.—Semibituminous coal, Pocahontas field; analyses Nos. 8633, 8634, 8732, 8736, 8737, 8845 (pp. 198, 199).

Mine.—Boissevain, a shaft mine, 185 feet deep, at Boissevain, on the Norfolk & Western Railway.

Coal bed.—Pocahontas No. 3. It is of Carboniferous age, and part of the Pocahontas formation. The thickness of the bed at the mine varies from 8 to 11 feet, including a portion of from 8 to 12 inches which, in the advance work, is left up for a roof. The bed has a dip of 70° SW. There is a cap rock of sandstone. The floor is a soft shaly clay with a smooth surface.

The bed was measured and sampled at five points by R. Y. Williams and A. C. Ramsay on August 4, 1909, as described below:

Sections of coal bed in Boissevain mine at Boissevain.

Section	A		B		C		D		E	
Laboratory No	8633		8634		8737		8736		8732	
Roof, roof coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (soft bright)	0	7½	2	2	1	4	2	8	2	½
Sulphur band	..	..	..	..	0	½	..	..	..	..
Bony coal [a]	0	3½	..	..	..	..	0	4½	0	1½
Coal (hard gray)	0	4¼	0	2	..	..	..	..	..	..
Coal	2	7¼	0	10½	1	4	0	6	0	4
Bony coal (gray) [a]	0	1½	0	2½	0	9	..	..	0	2
Coal (gray band)	..	..	..	..	0	10	0	3	..	..
Coal	2	8¾	1	6	2	0	2	1	1	10
Bony coal [a]	..	..	0	1	..	..	..	..	..	..
Coal (mother-coal streaks)	..	..	1	8¾	..	..	..	..	..	..
Bony coal [a]	..	..	0	1½	..	..	..	..	..	..
Coal	..	..	2	6¼	2	9	2	5	2	7¾
Bony coal [a]	..	..	..	..	..	..	..	..	0	3
Coal	..	..	..	..	..	..	..	..	2	6¾
Floor, shaly underclay.										
Thickness of bed	6	8¾	9	4½	9	½	8	3½	9	11½
Thickness of coal sampled	6	3¾	8	11½	8	3½	7	11	9	5

[a] Not included in sample.

Section A (sample 8633) was cut from the main entry, 3,000 feet from the shaft.

Section B (sample 8634) was cut from east entry 1, 2,000 feet from the shaft.

Section C (sample 8737) was cut from room 8, west entry 3, 1,500 feet from the shaft.

Section D (sample 8736) was cut from the face of east entry 3, 1,600 feet from the shaft.

Section E (sample 8732) was cut from the face of west entry 1, 1,200 feet from the shaft.

A composite sample was made by mixing samples 8632, 8633, 8634, 8736, and 8738 for an ultimate analysis, results of which are shown under laboratory No. 8845.

Notes.—The coal at this mine was undercut by hand and with chain machines at the middle of the bed, and was shot down with black powder. Sixty per cent of the output was shipped in run-of-mine form. The mine was equipped with three screens, having 1½, ¾, and ½ inch openings, and had a storage capacity of 1,000 tons. The coal was picked on picking tables by three trimmers. The average daily output in 1909 was 2,100 tons, 3,850 tons being the maximum day's run. The future output was to be derived principally from advance workings and the output was to be increased to 4,000 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 198, 199.

POCAHONTAS. BABY POCAHONTAS AND EAST POCAHONTAS MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 5268, 5269 (Jamestown No. 2) and analyses Nos. 7172, 7173, 8635, 8640, 8641, 8642, 8750 (p. 199).

Mine.—Baby Pocahontas and East Pocahontas mines; Clearfork district; ½ mile west of Pocahontas, on the Norfolk & Western Railway.

Coal bed.—Pocahontas No. 3. Carboniferous age, Pocahontas formation. At this mine the bed lies nearly flat and averages about 9½ feet thick. The roof is shale, but in mining 22 inches of top coal is left for a roof. The floor is shale.

The bed was measured and sampled at two points in the mine by K. M. Way, on August 5, 1907, as shown below:

Sections of coal bed in Baby Pocahontas mine, ½ mile west of Pocahontas.

Section	A		B	
Laboratory No	5268		5269	
Roof, coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	5	3	0
Bony coal [a]	0	4	0	4½
Coal	4	6	3	8
Sulphur	0	⅜	..	..
Bony coal [a]	..	..	0	3
Coal	1	0	1	9½
Sulphur	..	..	0	¼
Coal	..	..	0	11
Floor, shale.				
Thickness of bed	9	3⅜	10	¼
Thickness of coal sampled	8	11⅜	9	5¾

[a] Not included in sample.

Section A (sample 5268) was measured in room 37, off cross entry 9, off the main entry, 6,000 feet southwest of the drift mouth.

Section B (sample 5269) was measured in cross entry 4, off the diagonal entry, 6,700 feet southwest of the drift mouth.

The bed was also measured and sampled by G. S. Pope on January 14, 1909, as shown on the following page.

Sections of coal bed in Baby Pocahontas mine, ½ mile west of Pocahontas.

Laboratory No.	7172		7173	
Roof, shale and top coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	2	1	3¾
Gray coal	0	8¼	2	1
Bone	..	..	[a] 0	2
Bright coal	1	1¼	..	..
Mother coal	0	¼	..	..
Coal	..	..	[a] 0	1½
Bone	..	..	[a] 0	6
Coal	0	7	..	..
Gray coal	0	3¾	0	5½
Coal	0	4	0	3½
Bone	[a] 0	1½	[a] 0	3½
Coal	0	4	2	5½
Bone	[a] 0	2	[a] 0	2½
Coal	[a] 0	1	2	½
Bone	[a] 0	2	..	..
Soft coal	0	5¾	..	..
Mother coal	0	¼	..	..
Coal and bone	0	5½	..	..
Bone	[a] 0	5	..	..
Bright coal	0	2½	..	..
Bone	[a] 0	1½	..	..
Black sulphur	[a] 0	⅜	..	..
Coal	2	2	..	..
Floor, shale.				
Thickness of bed	8	11⅞	9	11¼
Thickness of coal sampled	7	10½	8	7¾

[a] Not included in sample

Sample 7172 was taken 7,300 feet west by 2,700 feet south of opening, face of diagonal entry.

Sample 7173 was taken 7,100 feet west of opening, in cross entry 1, off diagonal entry on break-through from airway to entry, opposite room 27.

The bed was also measured and sampled at three points in the Baby Pocahontas mine and at one point in the East Pocahontas mine by A. C. Ramsay on August 2 and 3, 1909, as described below:

Sections of coal bed in Baby Pocahontas mine, ¼ mile west of Pocahontas.

Section	A		B		C	
Laboratory No.	8642		8641		8640	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	..	..	2	½	1	4½
Bone [a]	..	..	0	2	0	3
Coal (hard and bright)	2	3¼	..	..	..	..
Bony coal [a]	0	7½	..	..	..	..
Coal	0	4¾	0	3½	1	8
Bony coal [a]	0	1¼	0	3	0	2
Coal	0	2½	0	4	0	3
Bony coal [a]	0	7½	0	6½	0	4
Coal (mother coal streaks)	3	2	0	5¼	0	3½
Bony coal [a]	0	3½	0	3	..	..
Coal (mother coal streaks)	2	2	0	2½	2	10
Bony coal [a]	..	..	0	3½	0	3
Coal	..	..	2	2½	1	3½
Bony coal	..	..	0	3½	..	..
Coal (mother coal streaks)	..	..	2	¼	..	..
Floor, soft clay.						
Thickness of bed	9	10¼	9	4	8	8½
Thickness of coal sampled	8	2½	7	10	7	8½

[a] Not included in sample.

Section A (sample 8642) was cut from the face of cross heading 1, 8,400 feet from the drift mouth.

Section B (sample 8641) was cut from the face of the diagonal main air course, 8,400 feet from the drift mouth.

Section C (sample 8640) was cut from the chain pillar of cross entry 8, 5,600 feet from the drift mouth.

A composite sample was made by mixing the face samples 8641 and 8642 for an ultimate analysis, the results of which are shown under laboratory number 8750.

The bed was measured and sampled as shown below:

Section of coal bed in East Pocahontas mine, ¼ mile west of Pocahontas.

Laboratory No.	8635	
	Ft.	*in.*
Roof, shale.		
Coal	0	3¼
Sulphur [a]	0	¾
Coal (mother coal streaks)	1	¼
Bony coal [a]	0	5
Coal (mother coal streaks)	2	½
Bony coal [a]	0	6½
Coal	0	1½
Bony coal [a]	0	3½
Coal	0	2
Bony coal [a]	0	6½
Coal (mother coal streaks)	2	10
Floor, soft clay.		
Thickness of bed	8	3¾
Thickness of coal sampled	6	5½

[a] Not included in sample.

Section A (sample 8635) was cut from a chain pillar on the main entry, 2,500 feet from the drift mouth. This pillar had been exposed to the air for 25 years.

Notes.—The coal at these mines was undercut by hand picks, and was shot down with black powder. The operator had a great many coke ovens, and used a large portion of the output in making coke. The capacity of these two mines in 1909 was 650 tons, the average daily output being 325 tons.

For results of briquetting tests of this coal, see U. S. Geol. Survey Bull. 385, p. 16.

For chemical analyses see part I of this bulletin, p. 199; also U. S. Geol. Survey Bull. 362, p. 10.

POCAHONTAS. WEST POCAHONTAS MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8613, 8614, 8615, 8636, 8637, 8638, 8639, 8745, 8749 (pp. 199, 200).

Mine.—West Pocahontas; a drift mine one-fourth mile west of Pocahontas, on the Pocahontas Branch of the Norfolk & Western Railway.

Coal bed.—Pocahontas No. 3. It is of Carboniferous age and is part of the Pocahontas formation. The coal at this mine varies in thickness from 9 feet to 13 feet; has a hard gray shale roof, about 8 feet in thickness, above which is a sandstone cap rock. In the greater portion of the advance work, a portion of the coal is left up for a roof. The floor is a soft underclay with a smooth surface. The coal separates readily from the roof and floor.

The bed was measured and sampled at five points by R. Y. Williams on August 2 and 3, 1909, and at two points by A. C. Ramsay on the same date, as described below:

Sections of coal bed in West Pocahontas mine, ¼ mile west of Pocahontas.

Section	A		B		C		D		E	
Laboratory No.	8636		8637		8613		8614		8615	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.										
Coal	1	4½	0	5	1	8	1	3	3	4
Sulphur [a]	..	..	0	¼	..	..	..	..	..	..
Coal (hard)	0	3	0	4	..	..	..	..	..	..
Bony coal [a]	..	..	0	4	0	5½	..	..	..	..
Coal	0	3	1	8	0	4½	..	..	..	..
Coal (gray)	0	3½	0	1	0	2	0	2	0	2½
Coal	0	1½	..	..	0	2	0	5	0	5
Coal (gray)	..	..	..	..	0	1½	0	1	0	3
Coal	..	..	..	..	0	1½	0	3	..	..
Bony coal [a]	0	4	..	..	..	..	0	2½	..	..
Coal	0	2	..	..	..	..	0	3	..	..
Coal (hard)	0	2	0	1	0	2½	0	1½	..	..
Coal	0	2½	..	..	4	11	2	8	1	9
Coal (hard)	0	2	1	4	..	..	0	4½	..	..
Coal	2	0	2	1½	..	..	2	3½	..	..
Coal (gray)	0	2	0	2½	..	..	..	..	..	..
Coal	2	7¾	2	2¾	..	..	..	..	..	..
Floor, clay.										
Thickness of bed	8	1¾	8	10	8	2½	8	1	5	11½
Thickness of coal sampled	7	9¾	8	5¾	7	9	7	10½	5	11½

[a] Not included in sample.

Sections of coal bed in West Pocahontas mine, ¼ mile west of Pocahontas—Continued.

Section	F		G	
Laboratory No.	8638		8639	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*
Sulphur [a]	0	¼	..	..
Coal (mother-coal partings)	1	2	0	10½
Sulphur [a]	0	¼	0	½
Coal	1	8½	2	2
Bony coal [a]	0	5	0	3½
Coal	0	4½	1	7½
Bony coal [a]	0	6	0	3
Coal	0	3	0	3½
Bony coal [a]	0	2	0	6½
Coal (mother coal streaks)	2	7½	0	8
Bony coal [a]	0	3	0	2
Coal (mother coal streaks)	2	3	1	4½
Bony coal [a]	..	..	0	1½
Coal (mother coal streaks)	..	..	1	5½
Floor, clay.				
Thickness of bed	9	9	9	10½
Thickness of coal sampled	8	4½	8	5½

[a] Not included in sample.

Section A (sample 8636) was cut from the face of right entry 8, off Norton aircourse, 2½ miles southwest of the drift mouth.

Section B (sample 8637) was cut from the pillar in room 14, Kingston entry, 10,500 feet from the drift mouth.

Section C (sample 8613) was cut from the face of right aircourse 6, off Newport News entry, 2 miles from the drift mouth.

Section D (sample 8614) was cut from the face of entry 3, off Newport News entry, 2 miles from drift mouth.

Section E (sample 8615) was cut from pillar in the haulway off Salem entry near room 2 on Bluefield entry.

Section F (sample 8638) was cut from a pillar in Jed entry, 11,000 feet from the drift mouth.

Section G (sample 8639) was cut from a pillar in the second left St. Paul entry, 900 feet from the drift mouth.

Composite samples were made by mixing the face samples 8613, 8614, and 8636, and the pillar samples 8638 and 8639 for ultimate analyses, the results of which are shown under laboratory numbers 8745 and 8749, respectively.

Notes.—In 1909 the coal was undercut with hand picks, and was shot down with black powder. The operator had a large number of coke ovens, and used a large proportion of the output in making coke. The capacity of the mine at the time of sampling was 400 tons, and the daily average output was 350 tons. The mine was assured of a large future tonnage, since there were 8,100 acres of unmined coal to be divided between the Pocahontas mines and the Boissevain mines. The future output was to be obtained in the proportion of 60 per cent from advance work and 40 per cent from pillars. The output of this mine should be considered in connection with the Baby Pocahontas and East Pocahontas mines. The three mines had a capacity of 1,050 tons and an average daily output of 675 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 199, 200.

RICHLANDS. RICHLANDS MINE.

Sample.—Bituminous coal; Russell Fork field; (Virginia No. 6) analyses Nos. 4304, 4305 (p. 200).

Mine.—Richlands; a drift mine 5 miles northwest of Richlands, on the Norfolk & Western Railroad.

Coal bed.—The bed worked at this mine is one of several exposed in the field, and is locally designated the No. 4. It is of Carboniferous age, Pottsville group. The thickness of the bed averages at the mine 5 feet ½ inch. The dip is slight. The roof is a hard, gray shale, and the floor a hard black shale.

The bed was measured and sampled at two points on December 8, 1906, by J. W. Groves, as shown on the following page.

Sections of coal bed in Richlands mine, 5 miles northwest of Richlands.

Section	A		B	
Laboratory No	4304		4305	
	Ft.	in.	Ft.	in.
Roof, shale.				
Coal	0	9½	0	7¾
Shale	[a] 0	5½	[a] 0	7
Coal	1	1	0	3½
Sulphur	..	..	0	⅛
Mother coal	0	⅛	..	..
Coal	0	6	0	11
Mother coal and sulphur	0	¼	..	..
Mother coal	..	..	0	⅛
Coal	0	2	0	10½
Mother coal and sulphur	[a] 0	½	0	¼
Coal	[a] 0	1	1	3¾
Mother coal and sulphur	[a] 0	¾	..	..
Coal	1	1	..	..
Rash	0	2½	..	..
Coal	0	10½	..	..
Floor, shale.				
Thickness of coal bed	5	4⅝	4	8
Thickness of coal sampled	4	8⅞	4	1

[a] Not included in sample.

Section A (sample 4304) was measured in the main straight entry, 2,000 feet south and 30 degrees east of the drift mouth.

Section B (sample 4305) was measured in room 12 of left entry 3, 1,600 feet east of the drift mouth.

Notes.—The output of this mine in 1906 averaged about 350 tons per day. The coal was largely sold for steam production. All the output was in run-of-mine form.

For results of tests of this coal see mention of specific tests as follows: Steaming tests—U. S. Geol. Survey Bull. 332, p. 270; Bureau of Mines Bull. 23, pp. 69, 185; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 270; Bureau of Mines Bull. 13, pp. 213, 276; washing tests: U. S. Geol. Survey Bull. 332, p. 271; Bull. 336, pp. 14, 16; coking tests: U. S. Geol. Survey Bull. 332, p. 272; Bull. 336, pp. 25, 34, 43.

For chemical analyses of this coal, see part I of this bulletin, p. 200; also U. S. Geol. Survey Bull. 332, p. 270.

WISE COUNTY.

GEORGEL. SWANSEA MINE.

Sample.—Bituminous coal; Russell Fork field; analysis No. 10386 (p. 201).

Mine.—Swansea; at Georgel, Toms Creek district, on the Norfolk & Western Railway.

Coal bed.—Upper Banner. Carboniferous age, Norton formation.

The bed was measured and sampled on April 29, 1910, by E. G. Woodruff, as shown below:

Section of coal bed in Swansea mine at Georgel.

Laboratory No	10386	
	Ft.	in.
Coal	2	4
Sandstone[a]	0	1½
Coal	1	8
Bone[a]	1	5
Coal	2	7
Thickness of bed	8	1½
Thickness of coal sampled	6	7

[a] Excluded from sample.

The sample was taken in room 21 off west entry 17, 2,600 feet from the outcrop.

For chemical analyses of this coal see part I of this bulletin, p. 201; also U. S. Geol. Survey Bull. 471.

NORTON. No. 4 MINE.

Sample.—Bituminous coal; Black Mountain field; analysis No. 10390 (p. 201).

Mine.—No. 4, ½ mile east of Norton.

The bed was measured and sampled on April 28, 1910, by E. G. Woodruff, as shown below:

Section of coal bed in No. 4 mine, ½ mile east of Norton.

Laboratory No.	10390	
	Ft.	*in.*
Roof, shale, hard.		
Shale, soft, taken down with coal [a]	0	10
Coal	0	8½
Shale [a]	0	3
Coal	1	7
Shale, soft [a]	0	2½
Coal	1	11
Thickness of bed	5	6
Thickness of coal sampled	4	2½

[a] Not included in sample.

The sample was taken in left heading 1, off entry 4.

For chemical analyses of this coal see part I of this bulletin, p. 201; U. S. Geol. Survey Bull. 471.

STONEGA. STONEGA MINE.

Sample.—Bituminous coal; Black Mountain field; analysis No. 10388 (p. 201).

Mine.—Stonega, at Stonega, Big Stone Gap district, on the Louisville & Nashville Railroad.

Coal bed.—Imboden. Carboniferous age, Norton formation.

The bed was measured and sampled on April 27, 1910, by E. G. Woodruff, as shown below:

Section of coal bed in Stonega mine at Stonega.

Laboratory No.	10388	
	Ft.	*in.*
Coal	3	7
Bone [a]	0	5½
Coal	2	3
Thickness of bed	6	3½
Thickness of coal sampled	5	10

[a] Excluded from sample.

The sample was taken in heading 11, off fifth left face.

For chemical analyses of this coal see part I of this bulletin, p. 201; also U. S. Geol. Survey Bull. 471.

TOMS CREEK. COBURN MINE.

Sample.—Bituminous coal; Black Mountain field; (Virginia No. 3) analyses Nos. 2281, 2282 (p. 201).

Mine.—Coburn, a drift mine at Toms Creek (Herald post office), on the Norfolk & Western Railroad.

Coal bed.—Locally known as the Upper Banner. Carboniferous age, Norton formation. Thickness, fairly uniform, averaging about 7 feet 9 inches. The bed lies practically flat. The roof is a bluish, sandy shale. The floor is shale.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on October 7, 1905, as shown on the following page.

Sections of coal bed in Coburn mine at Toms Creek.

Section	A		B	
Laboratory No.	2281		2282	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	2½	0	10
Sandstone	[a]0	1½	..	..
Mother coal	..	..	0	¼
Coal	1	6	1	6
Shale	[a]0	1½	..	..
Sandstone	..	..	[a]0	1
Coal	[a]0	2	1	8
Shale	[a]0	2	[a]0	1
Coal	[a]0	6	[a]0	2
Shale	[a]0	1½	[a]0	3
Coal	1	8	[a]0	6
Mother coal	0	¼	..	..
Shale	..	..	[a]0	1
Coal	1	0	2	7
Floor, shale.				
Thickness of bed	7	7¼	7	9¼
Thickness of coal sampled	6	4¾	6	7¼

[a] Not included in sample.

Section A (sample 2281) was measured in east heading 17, 3,000 feet northeast of the mine opening.

Section B (sample 2282) was measured in room 3, off west entry 11, 2,000 feet northeast of the mine opening.

Notes.—Most of the output of this mine in 1905 was made into coke near the mine, the operator having 800 beehive ovens. The mine supplied regularly about 1,500 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 194; Bureau of Mines Bull. 23, pp. 68, 184; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 195; Bureau of Mines Bull. 13, pp. 211, 276; coking tests: U. S. Geol. Survey Bull. 290, p. 196; Bull. 336, pp. 25, 34, 43; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 51, 55, 57, 60, 61, 63.

For chemical analyses see part I of this bulletin, p. 201; also U. S. Geol. Survey Bull. 290, p. 194.

Virginia City. Virginia City No. 1 Mine.

Sample.—Bituminous coal; Black Mountain field; (Jamestown No. 1) analyses Nos. 5235, 5217 (p. 201).

Mine.—Virginia City No. 1, a slope mine in the Lipps district, at Virginia City, on the Norfolk & Western Railway.

Coal bed.—Locally known as the "Jaw Bone." Carboniferous age, Norton formation. At this mine the bed lies nearly flat, and has an average thickness of about 7 feet 4 inches. The roof is sandstone. The floor is shale.

The bed was measured and sampled at two points in the mine by K. M. Way on July 26, 1907, as shown below:

Sections of coal bed in Virginia City No. 1 mine at Virginia City.

Section	A		B	
Laboratory No.	5235		5217	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	5	0	6½
Sandstone	[a]0	¼	..	..
Rash	..	..	[a]0	2
Coal	0	2	1	9½
Rash	[a]0	½	..	..
Bony coal	..	..	0	2
Coal	1	4½	1	5
Shale and coal	[a]0	7	..	..
Bony coal	0	3	0	2
Coal	4	6	4	½
Floor, shale.				
Thickness of bed	7	4¼	8	3½
Thickness of coal sampled	6	8½	8	1½

[a] Not included in sample.

Section A (sample 5235) was measured in a break-through between the third and fourth cross entries, 3,200 feet northwest of the mine opening.

Section B (sample 5217) was measured in room 8, off the first cross heading, 2,400 feet northwest of the mine opening.

Notes.—The coal, like that from many other mines in this district, is rather soft and friable. In 1907 the output was shipped as run-of-mine, lump, nut, and slack coal. The total production in 1906 was about 10,000 tons, of which 3,500 tons was run-of-mine, 3,500 lump, and 3,000 tons nut and slack. The lump coal represented that which went over a 1¼-inch screen, and the nut and slack that which went through. The coal was cleaned mechanically by slate pickers.

For chemical analyses of this coal see part I of this bulletin, p. 201; also U. S. Geol. Survey Bull. 362, p. 9.

WASHINGTON.[a]

CLALLAM COUNTY.

CLALLAM. FUCA MINE.

Sample.—Bituminous coal; Washington field; analysis No. 10030 (p. 201).

Mine.—Fuca, a drift mine 4 miles east of Clallam on the shore of the Strait of San Juan de Fuca.

Coal beds.—Several are reported in this series, but only one was being developed in 1910. Roof, sandstone and shale; floor, shale and sandstone. Dip, 60° W.; thickness, 1 foot 6 inches to 2 feet 6 inches, average being about 1 foot 10 inches. The bed is so thin that in the gangways about 4 feet of the roof is brushed down for headroom.

The bed was measured and sampled by E. E. Smith in February, 1910. The sample represented 1 foot 11 inches of coal. It was taken at a point about 100 feet above the gangway in chute 6, about 400 feet from the entrance of the mine.

Notes.—In 1910 the coal was passed over 1-inch and also ½-inch bar screens at the tipple. The oversize from the larger screen was hand picked. The coal is hard and brittle. Although it contains nearly as much moisture as many subbituminous coals, it gives off little when exposed to the air and hence does not slack. The percentage of sulphur present is caused by many minute lenses of marcasite or pyrite disseminated through the mass of the coal. The bed contains many nodules of pyrite from an inch up to several feet in length, which can be readily separated in picking and washing. The coal differs from any other coal sampled in the State. It resembles subbituminous coal in moisture content and heating value, but its ability to withstand transportation entitles it to be classed as bituminous coal.

For chemical analyses of this coal see part I of this bulletin, p. 201; also U. S. Geol. Survey Bull. 474, p. 41.

For geologic relations see U. S. Geol. Survey Bull. 260, p. 414; Bull. 474, p. 77.

KING COUNTY.[b]

BARNESTON. PROSPECT.

Sample.—Semianthracite or natural coke; Washington field; analysis No. 9111 (p. 201).

Location.—A prospect drift; a 70-foot drift near Barneston, in the SE. ¼ NW. ¼ sec. 12, T. 22 N., R. 7 E., on the Northern Pacific Railway.

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[a] For further details of coals sampled in Washington see U. S. Geol. Survey Bull. 474, Coals of the State of Washington, by E. E. Smith, 1911, 206 pp.

[b] For more detailed descriptions of the King County coals, see U. S. Geol. Survey Bull. 374, pp. 80–129.

Coal bed.—The coal has been altered by igneous action. The upper bench of the bed is almost entirely changed to natural coke and the lower bench is partly altered.

The bed was measured and sampled by E. E. Smith in 1909–10, as described below:

Section of coal bed in prospect drift near Barneston.

Laboratory No	9111.
Roof, igneous rock.	*Ft. in.*
Shale, black with thin streaks of coal	1 2½
Igneous rock [a]	0 6
Shale with streaks of coked coal	3 0
Thickness of bed	4 8½
Thickness of coal sampled	4 2½

[a] Not included in sample.

The sample was taken about 10 feet from the entrance to the drift.

Notes.—Both the roof and the floor of the bed are an igneous rock. The parting in the middle of the bed appears to be of the same rock, but is so decayed that it can be readily broken in the hand. This parting has about the position indicated for 30 feet from the drift entrance. It then turns upward and lies immediately under the roof. The upper bench of the bed is changed almost entirely to natural coke and the lower bench is partly altered.

For chemical analyses of this coal see part I of this bulletin, p. 201.

Bayne: Bayne Mine.

Sample.—Bituminous coal; Washington field; analyses Nos. 9109, 9110, 9112, 9268, 9269, 9275, 9483 (pp. 201, 202).

Mine.—Bayne; a tunnel and drift mine in the NW. ¼, NW. ¼ sec. 22, T. 21 N., R. 7 E., at Bayne, on the Northern Pacific Railway.

Coal beds.—Three coal beds were being worked, designated, in ascending order, Nos. 1, 3, and 5. They are separated from each other by several hundred feet of sandstone. They dip 34° NE. The beds are uniform in thickness and the partings are fairly continuous.

The beds in this mine were measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed No. 1 in Bayne mine at Bayne.

Laboratory No	9112
Roof, black shale.	*Ft. in.*
Coal	0 10
Shale, black, carbonaceous, hard	0 ½
Coal	1 9½
Shale, soft, carbonaceous [a]	0 3½
Coal	0 3½
Shale, hard [a]	0 1
Coal, with small "niggerheads"	1 1
Shale, black, carbonaceous [a]	0 2
Coal	0 3½
Shale, carbonaceous [a]	0 ½
Coal	0 3½
Shale, black [a]	0 2
Coal	1 2½
Floor, brown, carbonaceous shale.	
Thickness of bed	6 7
Thickness of coal sampled	5 10

[a] Not included in sample.

Section of coal bed No. 3 in Bayne mine at Bayne.

Laboratory No	9110	
	Ft.	*in.*
Roof, sandy shale.		
Coal	1	8½
Shale, carbonaceous, very soft [a]	0	2½
Coal	0	9½
Shale, gray [a]	0	1
Coal	0	4
Shale, gray [a]	0	2
Coal	0	5
Shale, gray [a]	0	2½
Coal	0	1
Shale, gray [a]	0	1
Coal	0	7
Floor, black, carbonaceous shale.		
Thickness of bed	4	8
Thickness of coal sampled	3	11

[a] Not included in sample.

Sections of coal bed No. 5 in Bayne mine at Bayne.

Laboratory No	9109		9268, 9269, 9275	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Shale, black [a]	0	7	..	..
Coal	2	2½	2	0
Shale, soft, brown, carbonaceous [a]	0	2½	..	..
Coal	2	7	..	..
Floor, carbonaceous shale.				
Thickness of bed	5	7	2	0
Thickness of coal sampled	4	9½	2	0

[a] Not included in sample.

Section of coal bed highest on hill above Bayne mine at Bayne.

Laboratory No	9483	
	Ft.	*in.*
Roof, shale.		
Coal	0	2
Shale, carbonaceous [a]	0	1
Coal, slightly bony	1	0
Sand [a]	0	½
Coal, stringy and slightly bony	0	8
Floor, yellowish clay.		
Thickness of bed	1	11½
Thickness of coal sampled	1	10

[a] Not included in sample.

Sample 9112 was taken on the north side of the main rock tunnel where it cuts bed No. 1. The bed contains numerous partings, most of which can be separated from the coal by washing. The top parting only was included in the sample.

Sample 9110 was taken from the face of the south gangway on bed No. 3, about 70 feet from the main tunnel. The shale partings can be separated from the coal by picking and washing, and were not included in the sample.

Sample 9109 was taken 55 feet above the gangway on bed No. 5 and 15 feet to the left of chute No. 9. The roof and the floor of the bed are both good.

Samples 9275, 9268, and 9269 were taken in the NE. ¼ NW. ¼ sec. 22, T. 21 N., R. 7 E., from the lower 2 feet of good coal from the No. 5 bed in a small drift at the outcrop. They were taken to show the effect of weathering.

Sample 9275 was taken at the entrance to the drift 1 foot beyond the first set of timbers. The coal was weathered.

Sample 9268 was taken 9 feet beyond the first set of timbers. The coal was weathered and appeared to be somewhat shaly.

Sample 9269 was taken 15 feet from the first set of timbers. The coal was bright and firm and should have represented about the best coal from the No. 5 bed in the mine proper.

Sample 9483 was taken from the highest bed on the hill above the Bayne mine in the NW. ¼ sec. 22, T. 21 N., R. 7 E. The bed was poorly exposed in a small prospect.

Notes.—The coal is bituminous, shows coking tendencies, and was used at the mine as blacksmith coal for rough work.

For chemical analyses of this coal see part I of this bulletin, pp. 201, 202.

BAYNE. PROSPECT.

Sample.—Bituminous coal; analysis No. 9488 (p. 202).

Location.—Prospect drift; a small drift about ¼ mile west of Bayne, in the northeast corner of sec. 21, T. 21 N., R. 7 E.

Coal bed.—The bed belongs to the same formation as that exposed at the Occidental and Bayne mines. It lies nearly horizontal in the center of the syncline that passes through Lizard Mountain. At the point where the sample was taken the bed dips nearly 8° W. The partings were not uniform in thickness.

The bed was measured and sampled by E. E. Smith in 1909–10 as described below:

Section of coal bed in prospect drift, one-fourth mile west of Bayne.

Laboratory No	9488	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal	0	8½
Shale, black, carbonaceous[a]	0	½
Coal	1	6
Shale, brown, sandy[a]	0	2½
Coal	0	8½
Shale, sandy[a]	0	1
Coal	0	11
Shale, sandy, carbonaceous[a]	0	1
Coal	1	3½
Floor, shale.		
Thickness of bed	5	6½
Thickness of coal sampled	5	1½

[a] Not included in sample.

The sample was taken 72 feet from the entrance to the drift, on the upper side of the gangway.

Notes.—The coal does not weather on exposure to the air. It shows coking tendencies and should compare favorably with the coals from the mines in the immediate neighborhood.

For chemical analyses of this coal see part I of this bulletin, p. 202.

BAYNE. OCCIDENTAL MINE.

Sample.—Bituminous coal; Washington field; analyses Nos. 9479, 9480, 9478, 9475, 9481, 9477, 9476, 9491 (pp. 202, 203).

Mine.—Occidental; two slope mines and one drift, one-fourth mile northwest of Bayne, in the SE. ¼ sec. 16, T. 21 N., R. 7 E., on a spur of the Northern Pacific Railway.

Coal beds.—Sixteen beds of coal and carbonaceous material have been reported in this group. They are numbered in descending order. Beds Nos. 1, 2, 3, 4, 5, 6, and 14 have been opened at different times. At the time of the sampling the openings on Nos. 4 and 5 were closed and these beds could not be sampled. The beds dip 38° SE. The beds and partings are nearly uniform in thickness throughout the workings.

The coal beds in the Occidental mine were sampled and measured by E. E. Smith in 1909–10, as shown on the following page.

Section of coal bed No. 1 in the Occidental mine at Bayne.

Laboratory No	9479	
Roof, shale.	*Ft.*	*in.*
Clay and coal, irregular streaks [a]	1	0
Coal	1	5
Shale, slightly bony, altered locally to "niggerheads"[a]	0	3½
Coal, bony	0	1
Coal, bright	4	1
Floor, bony, coal.		
Thickness of bed	6	10½
Thickness of coal sampled	5	7

[a] Not included in sample.

Section of coal bed No. 2 in the Occidental mine at Bayne.

Laboratory No	9480	
Roof, black carbonaceous shale.	*Ft.*	*in.*
Coal, bright	1	1
Shale, sandy, brown, varies up to 3½ inches [a]	0	1
Coal	0	2
Clay, soft, pale yellow, varies from 1 to 5 inches [a]	0	2½
Coal	0	3
Shale, brown, carbonaceous [a]	0	½
Coal, bright	1	5
Shale, brown [a]	0	½
Coal, bright	0	5½
Thickness of bed	3	9
Thickness of coal sampled	3	4½

[a] Not included in sample.

Sections of coal bed No. 3 in the Occidental mine at Bayne.

Laboratory No	9475		9478	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11½	..	..
Coal, slightly bony near center	..	..	1	5
Bone [a]	0	½	..	..
Clay [a]	..	..	0	1
Coal	0	8½	..	..
Coal, hard, bright	..	..	1	11
Bone [a]	0	½	..	..
Coal	1	9½	..	..
Shale [a]	0	2½	0	2½
Coal	0	11	1	5
Shale, sandy [a]	0	½	..	..
Coal	0	5	..	..
Floor, shale.				
Thickness of bed	5	1½	5	½
Thickness of coal sampled	4	9½	4	9

[a] Not included in sample.

Section of coal bed No. 6 in the Occidental mine at Bayne.

Laboratory No	9481	
Roof, black, carbonaceous shale.	*Ft.*	*in.*
Coal	1	2½
"Sulphur" band [a]	0	1
Coal	1	5
Shale, brown, sandy [a]	0	3½
Coal	0	7
Floor, brown, soft shale.		
Thickness of bed	3	7
Thickness of coal sampled	3	2½

[a] Not included in sample.

Sections of coal bed No. 14 in the Occidental mine at Bayne.

Laboratory No.	9477		9476	
Roof, carbonaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, hard, bony	1	0	..	..
Coal, soft, bony	0	½	..	..
Coal	2	9½	..	..
Coal, hard, bright	1	6	1	6
Shale[a]	0	1	..	..
Coal	0	8½	..	..
Floor, carbonaceous shale.				
Thickness of bed	6	1½	1	6
Thickness of coal sampled	6	½	1	6

[a] Not included in sample.

Sample 9479 was taken from the abandoned workings of bed No. 1 on the side of an air course 550 feet from the entrance to the first water level and 250 feet above the water-level gangway. The bed there contains a layer of bony shale which is altered locally to "niggerheads." Above the coal are irregular bands of clay and coal, which tend to fall in the rooms.

Sample 9480 was taken on bed No. 2, 70 feet up a chute, 310 feet from entrance to the gangway. The roof is of carbonaceous shale and does not mix to any extent with the coal in mining.

Sample 9478 was taken from bed No. 3 about 100 feet above the first level on the manway, 30 feet northeast of the slope.

Sample 9475 was taken from bed No. 3 about 660 feet up the dip from the first level, in chute 7. Both roof and floor are good and do not mix with the coal.

Sample 9481 was taken from the south side of an old air course on bed No. 6, about 112 feet from the surface. The air course is about 300 feet northeast from chute 7, on bed No. 3. The roof of the bed is firm and does not mix with the coal. The bed is underlain with 2½ inches of soft shale, which parts from the floor with the coal and must be removed at the bunkers.

Sample 9477 was taken at the new mine, in a room about 200 feet down the slope on bed No. 14, and 30 feet to the west. The roof and floor were firm there and did not mix to any extent with the coal, but farther along the gangway the bed was badly broken and the roof and floor mixed considerably with the coal.

Sample 9476 was taken from the same place that sample 9477 was obtained. It was composed of coal from the 1-foot 6-inch bench of good coal in the lower portion of the bed.

Analysis No. 9491 was made of a composite sample containing equal parts of samples 9476 and 9477.

Notes.—The coal from beds Nos. 1, 2, and 3 and the lower part of bed No. 14 is pitch black, with a dark-brown streak and a vitreous luster. It is massive and breaks with an irregular fracture; it does not crumble on exposure. It cokes on a blacksmith forge and it was used to some extent as blacksmith coal. The coal from the No. 6 bed and from the upper bench of No. 14 bed is grayish black, has a dark-brown streak, and a dull luster. It does not crumble on exposure. It shows coking tendencies.

For chemical analyses of this coal see part I of this bulletin, pp. 202, 203.

BAYNE. CARBON MINE.

Sample.—Bituminous coal; Washington field; analyses Nos. 9485, 9489, 9486, 9492 (p. 203).

Mine.—Carbon; a drift mine in the SE. ¼ sec. 15, T. 21 N., R. 7 E., about ½ mile northeast of Bayne, on the Northern Pacific Railway.

Coal bed.—The bed dips about 10° SE. The upper or No. 1 bed was the only one being worked at the time of sampling. The No. 2 bed is only a few feet from the No. 1

at the far end of the gangway, but toward the entrance of the mine this parting is about 25 feet thick.

The coal beds in the Carbon mine were measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed No. 1 in the Carbon mine, ½ mile northeast of Bayne.

Laboratory No	9485	
Roof, clayey shale.	*Ft.*	*in.*
Coal, bony [a]	0	1
Coal	2	9½
Shale, sandy [a]	0	2½
Coal	0	9½
Shale, clayey [a]	0	1
Coal	0	5 +
Floor, shale.		
Thickness of bed	4	4½+
Thickness of coal sampled	4	0

[a] Not included in sample.

Sample 9485 was taken from No. 1 bed at a point 630 feet west and 590 feet north of the southeast corner of sec. 15, T. 21 N., R. 7 E. About an inch of bony coal above the bed mixes with the coal to some extent in mining.

Sample 9489 included 2 feet 8½ inches of coal and was taken from the No. 2 bed at a point 380 feet west and 844 feet north of the southeast corner of section 15. The coal was being worked only in the gangway.

Sample 9486 was taken from spherical nodules of coal, 2 inches to 1 foot in diameter, that are numerous in the bed.

Analysis No. 9492 was of a composite sample consisting of equal parts of samples 9485 and 9486.

Notes.—The coal from both beds does not weather on exposure and forms fair coke. The coal was picked at the bunkers and washed in a jig washer.

For chemical analyses of this coal see part I of this bulletin, p. 203.

BAYNE. EUREKA MINE.

Sample.—Bituminous coal; Washington field; analysis No. 9294 (p. 203).

Mine.—Eureka; an abandoned mine in sec. 28, T. 21 N., R. 7 E., about 1 mile south of Bayne.

Coal bed.—The bed dips 38° SW. As exposed in the gangway it contains many partings of shale and bony coal.

The bed was measured and sampled by E. E. Smith in 1909, as shown below:

Section of coal bed in Eureka mine, 1 mile south of Bayne.

Laboratory No	9294	
Roof, black, carbonaceous shale.	*Ft.*	*in.*
Coal	1	0
Shale, brown, and slate [a]	0	2½
Coal	2	1
Coal, crushed	1	0
Sulphur band and sandy shale [a]	0	2½
Coal	0	9½
Bone and shale [a]	0	5
Coal [a]	0	3½
Shale [a]	0	2½
Coal [a]	0	5
Shale [a]	0	1
Coal [a]	0	3½
Bone and shale [a]	0	2½
Mixture bone and shale crushed [a]	1	7
Bone [a]	0	3½
Coal, crushed, bony [a]	0	6
Shale, carbonaceous [a]	0	2½+
Thickness of bed	10	9½+
Thickness of coal sampled	4	10½

[a] Not included in sample.

The sample was taken from the side of the gangway, 174 feet from the entrance of the mine. The two partings in the part of the bed sampled can be separated by picking and washing.

Note.—The coal is pitch black, has a dark-brown streak and a vitreous luster, and does not weather on exposure to the air.

For chemical analyses of this coal see part I of this bulletin, p. 203.

BAYNE. BIG SIX MINE.

Sample.—Bituminous coal; Washington field; analysis No. 9278 (p. 203).

Mine.—Big Six; a drift mine in the NW. ¼ NE. ¼ of sec. 23, T. 21 N., R. 7 E., 1½ miles east of Bayne, on a spur of the Northern Pacific Railway.

Coal bed.—This bed has frequently been called the Pocahontas. It strikes N. 12° W. and dips about 31° E. At the time of sampling, the mine had been closed for some time. The main rock tunnel was badly caved.

The main bench could not be sampled. A section and sample of the upper bench were obtained on September 15, 1909, by E. E. Smith from a small drift at the outcrop, near the fan house, as shown below:

Section of coal bed in Big Six mine, 1½ miles east of Bayne.

Laboratory No	9278	
Roof, carbonaceous, bony shale.	*Ft.*	*in.*
Coal, good	1	5
Shale, brown[a]	0	2
Coal, good	1	1
Shale, brown[a]	0	1
Coal	0	4
Parting, carbonaceous sandy shale.		
Thickness of bed	3	1
Thickness of coal sampled	2	10

[a] Not included in sample.

The sample was taken about 30 feet from the entrance to the drift. The bench is separated from the main or lower bench by only a foot or two of shale.

For chemical analyses of this coal see part I of this bulletin, p. 203.

BLACK DIAMOND. NO. 14 MINE.

Sample.—Bituminous coal; Washington field; analyses Nos. 9114, 9105 (p. 203).

Mine.—No. 14; a slope mine in the NW. ¼ SE. ¼ sec. 14, T. 21 N., R. 6 E., ¼ mile east of Black Diamond, on the Columbia & Puget Sound Railroad.

Coal bed.—Two beds were worked in 1910. The lower one was known as the McKay and the upper one as the Little McKay or the Upper McKay. At the surface these beds are separated by about 4 feet of shale and bony coal, but at the ninth level, 3,200 feet down the dip, the beds are separated by about 90 feet of sandstone. At the main slope the beds dip 30° S. Beyond the electric slope in the west end of the working the dip is 30° SW. The beds are uniformly thick and the partings are fairly continuous.

The beds in the No. 14 Mine were measured and sampled by E. E. Smith in 1909–10, as described below:

Section of the McKay coal bed in No. 14 Mine, ¼ mile east of Black Diamond.

Laboratory No	9105	
Roof, brown sandy shale.	*Ft.*	*in.*
Coal	5	½
Coal, bony, soft	0	3
Thickness of bed	5	3½
Thickness of coal sampled	5	3½

Section of the Upper McKay coal bed in the No. 14 Mine, ¼ mile east of Black Diamond.

Laboratory No.	9114
	Ft. in.
Roof, brown shale.	
Coal, bright, black	0 11½
Shale, black, carbonaceous [a]	0 7
Coal	2 9½
Floor, black carbonaceous shale.	
Thickness of bed	4 4
Thickness of coal sampled	3 9

[a] Not included in sample.

Sample 9105 was taken from the McKay bed 70 feet from the gangway in chute 59 of the eighth level north.

Sample 9114 was taken from the Upper McKay bed 20 feet beyond chute 16 on the eighth level gangway north.

Notes.—The coal of the McKay bed is pitch black with a dark-brown streak. It is massive and does not slack when exposed to the sun. It is considered noncoking. The coal of the Upper McKay bed may be readily distinguished from the McKay coal by its slightly banded texture. It is a noncoking coal.

For chemical analyses of this coal see part I of this bulletin, p. 203.

BLACK DIAMOND. LAWSON MINE.

Sample.—Bituminous coal; Washington field; analyses Nos. 9104, 9107 (p. 203).

Mine.—Lawson, a slope mine in the SW. ¼ NW. ¼ of sec. 13, T. 21 N., R. 6 E., 1 mile northeast of Black Diamond, on the Columbia & Puget Sound Railroad.

Coal bed.—The Upper or Little McKay and the McKay proper are practically one bed in this mine. However, only the McKay proper was mined, except in the gang way, where the upper bed was taken out to give additional height. The beds are separated by about 10 inches of hard black carbonaceous shale, which was used as a roof for the McKay bed in most of the working places. At thfs mine the McKay bed is of uniform thickness. It dips 60° E. at the west end of the workings, and dips 30° S. at the east end of the workings.

The beds were measured and sampled by E. E. Smith in 1909, as shown below:

Section of Upper McKay coal bed in Lawson mine, 1 mile northeast of Black Diamond.

Laboratory No.	9107
	Ft. in.
Roof, shale.	
Coal, with few layers of carbonaceous shale	2 2
Shale, black, carbonaceous [a]	0 1
Coal	1 0
Shale, brown, sandy [a]	0 1
Coal, bony [a]	0 2½
Coal, fair	1 2½
Floor, shale, black, carbonaceous.	
Thickness of bed	4 9
Thickness of coal sampled	4 4½

[a] Not included in sample.

Sample 9104 was taken from the McKay bed and included 4 feet 9 inches of good coal, which was underlain with brown carbonaceous shale and overlain with 11 inches of black carbonaceous shale. It was taken from the side of the gangway between chutes Nos. 73 and 74 of the sixth level.

Sample 9107 was taken from the Upper McKay bed at the same place from which sample 9104 was taken.

Notes.—At the time of sampling the partings were not removed from the coal in the mine. At the bunkers the coals were picked over separate screens. The upper bench was picked more carefully than the lower, in order to remove the shale partings.

The coal of the McKay bed is pitch black, with a dark-brown streak; is massive and does not slack on exposure to the sun. It is considered noncoking. The coal of the Upper McKay bed may be readily distinguished from the McKay coal by its slightly banded texture. Like the McKay, it is considered noncoking.

For chemical analyses of this coal see part I of this bulletin, p. 203.

BLACK DIAMOND. MORGAN MINE.

Sample.—Bituminous coal; analyses Nos. 9106, 9108 (p. 203).

Mine.—Morgan, a slope mine in the SW. ¼ sec. 11, T. 21 N., R. 6 E., 1 mile northwest of Black Diamond, on the Columbia & Puget Sound Railroad.

Coal bed.—The mine works two beds, the McKay and the Little or Upper McKay. Near the surface the two beds are separated by about 10 feet of shale and sandstone, but about 3,000 feet down the dip the beds are separated by about 90 feet of sandstone. The beds dip about 25° W. Both beds are uniformly thick in this mine, and the partings are fairly regular for considerable distances.

The beds were measured and sampled by E. E. Smith in 1909–10, as described below:

Section of McKay coal bed in Morgan mine, 1 mile northwest of Black Diamond.

Laboratory No.	9106	
	Ft.	*in.*
Roof, shale.		
Coal, good, clean, bright	6	0
Coal, shaly, and bone [a]	0	1
Coal, good [a]	0	2½
Floor, shale and bone.		
Thickness of bed	6	3½
Thickness of coal sampled	6	0

[a] Not included in sample.

Section of Upper McKay coal bed in Morgan mine, 1 mile northwest of Black Diamond.

Laboratory No.	9108	
	Ft.	*in.*
Roof, black shale.		
Coal	1	4
Shale [a]	0	2
Coal, good	3	2½
Floor, shale.		
Thickness of bed	4	8½
Thickness of coal sampled	4	6½

[a] Not included in sample.

Sample 9106 was taken from the McKay bed on the north side of chute 46 about 12 feet above the north gangway of the sixth level. At this point the bed had a good roof, but was underlain with about 3½ inches of shaly coal and good coal, which in places broke from the floor and had to be separated at the bunkers.

Sample 9108 was taken from the upper McKay bed on the south side of chute 11, about 15 feet above the north gangway on the sixth level.

Notes.—The appearance of the coal of the McKay bed is the same as in other mines in the district. It is considered noncoking. The coal of the upper McKay bed is much like that from the McKay, but may be readily distinguished by its slightly banded texture. At the time of sampling the partings were not separated from the coal in mining. At the bunkers the coals from the lower bed and from the upper bed were picked over different screens. The upper bench was picked more carefully than the lower in order to remove the shale partings.

For chemical analyses of this coal see part I of this bulletin, p. 203.

COAL CREEK. FORD AND BAGLEY MINES.

Sample.—Subbituminous coal; analyses Nos. 9163, 9166, 9165, 9168, 9164, 9167, 9170, 9171, 9169 (pp. 203, 204).

Mines.—Ford and Bagley; slope and drift mines in T. 24 N., R. 5 E., at Coal Creek, on the Columbia & Puget Sound Railroad.

Coal bed.—Four coal beds were worked in 1910 in these mines: the Muldoon, the No. 3, and the No. 4 in the Ford, and the Muldoon and the Bagley in the Bagley. The beds dip 36° to 43° N., and are rather irregular, the thickness and number of the partings varying considerably within short distances. The distance between the beds, or the benches in the beds, varies considerably in the opposite ends of the workings. The layer of bony coal overlying the No. 3 bed is 1 foot 5 inches thick at 700 feet east of the cross tunnel from the Muldoon, but is 30 feet thick one-half mile to the east. At the latter point the layer of bony shale between the upper and lower bench thickens from 8½ inches to 1 foot 6 inches within a distance of 600 feet. Near the west end of the old workings the thickness of this parting increases rapidly, from a few feet to nearly 90 feet at the entrance to the old New Castle mine. The beds in this mine were measured and sampled by E. E. Smith in 1909, as described below:

Sections of the Muldoon coal bed in Ford mine at Coal Creek.

Laboratory No.	9165		9166		9163	
Roof, shale, compact, scales off.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Shale, carbonaceous[a]	0	1	0	1	..	..
Coal	0	10	0	8	..	..
Coal, bony[a]	0	1	0	2	0	1
Coal	0	6	0	5	2	2
Clay, "sulphur" band	..	..	0	¼	..	..
Bone, sandy[a]	..	..	..	..	..	..
Shale, gray-brown[a]	0	½	..	..	0	1
Coal	0	9½	0	10	0	8
Shale, brown, clayey[a]	..	..	0	1	..	..
Shale, slate-colored[a]	0	1	..	..	..	..
Shale, gray-brown, streaks of coal[a]	..	..	..	..	0	2½
Coal	0	7	0	5	0	8
Shale, brown[a]	..	..	0	1	..	..
Shale, slate-colored[a]	0	2½	..	..	..	..
Shale, brown at center, grades to coal each way[a]	..	..	..	..	0	5
Coal	0	6	0	6½	1	8½
Shale[a]	..	..	0	3	..	..
Coal, bony[a]	0	1	..	..	..	..
"Sulphur" band[a]	..	..	..	..	0	1
Shale, brown, carbonaceous[a]	0	2	..	..	..	..
Shale, soft, slacks[a]	..	..	..	..	0	1½
Coal, bony[a]	0	1	..	..	..	..
Coal	1	0	0	9½	..	..
Shale and bone[a]	..	..	0	½	..	..
Shale, clayey	0	½	..	..	..	..
Coal	1	0	1	0	..	..
Floor: 9165, bony coal; 9166, carbonaceous shale; 9163, compact shale.						
Thickness of bed	6	1	5	4¾	6	2½
Thickness of coal sampled	5	5	4	8	5	2½

[a] Not included in sample.

Sections of coal bed No. 3 in Ford mine at Coal Creek.

Laboratory No.	9168		9164	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	1	9½
Shale, black, carbonaceous[a]	0	3	..	..
Coal	2	1	..	..
Coal, bony	0	¼	..	..
Coal	0	3½	..	..
Coal, bony[a]	0	½	..	..
Coal	0	8	..	..
Shale, brown[a]	0	½	..	..
Coal	0	7	..	..
Floor, hard, black shale.				
Thickness of bed	4	7¾	1	9½
Thickness of coal sampled	4	3¾	1	9½

[a] Not included in sample.

Section of coal bed No. 4 in Ford mine at Coal Creek.

Laboratory No	9167	
Roof, white shaly sandstone.	*Ft.*	*in.*
Shale, brown, carbonaceous [a]	0	1
Coal	0	8½
Shale, yellow-brown [a]	0	1
Coal	0	2½
Coal, bony [a]	0	2
Coal	0	2½
Coal	1	9
Coal, slightly bony, soft	0	2½
Coal	1	5
Floor, yellowish-brown shale.		
Thickness of bed	4	10
Thickness of coal sampled	4	6

[a] Not included in sample.

Section of Bagley No. 1 coal bed in Bagley mine at Coal Creek.

Laboratory No	9170	
Roof, brown, carbonaceous shale.	*Ft.*	*in.*
Coal, banded	1	3
Shale, brown, carbonaceous [a]	0	1
Coal, banded	1	3½
Shale, yellow [a]	0	½
Coal	0	6½
Shale, brown [a]	0	½
Coal, bony	0	3
Shale, brown [a]	0	½
Coal	0	11½
Shale, brown, "sulphur" [a]	0	½
Coal	0	5½
Floor, hard shale.		
Thickness of bed	5	0
Thickness of coal sampled	4	9

[a] Not included in sample.

Sections of Bagley No. 2 coal bed in Bagley mine at Coal Creek.

Laboratory No	9171		9169	
Roof: 9171, white sandstone; 9169, hard, carbonaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Shale carbonaceous	0	½	..	..
Coal	0	7	..	..
Shale, carbonaceous [a]	0	6	..	..
Coal	0	3½	..	..
Coal, badly crushed	0	½	..	..
Coal	0	5½	..	..
Shale, hard, nearly black [a]	0	1	..	..
Coal, bony	0	2½	..	..
Shale, sandy, "sulphur" band [a]	0	½	..	..
Coal, bony, with streaks of shale	0	5	..	..
Coal	..	..	1	7
Shale, soft, very carbonaceous [a]	..	..	0	1
Coal	..	..	2	5
Floor, shale.				
Thickness of bed	2	7	4	1
Thickness of coal sampled	1	11½	4	0

[a] Not included in sample.

Sample 9163 was taken from the Muldoon bed at the east end of the first air course above the gangway on the first level, about 5,400 feet east of the slope in the Ford mine. A thin layer of soft bony coal and shale above the upper bench came down with the coal during mining, and had to be removed at the washer. A band of pyrite and a thin layer of soft shale at the bottom of the lower layer broke from the floor and had to be similarly separated.

Sample 9166 was taken from the first level gangway on the Muldoon bed, 5,750 feet west of the slope in the Ford mine. A thin layer of carbonaceous shale between the coal and the roof and another between the coal and the floor became mixed with the coal in mining and had to be removed at the bunkers.

Sample 9165 was taken from the first level gangway on the Muldoon bed, 1,400 feet west of slope and 80 feet up chute 13½, in the Ford mine. The bed contained several partings, most of which could be separated from the coal by picking and washing, but half of the upper parting and the entire lowest parting were included in the sample. A thin layer of carbonaceous shale broke from the roof in mining and had to be picked out at the bunkers.

Sample 9168 was taken from the upper bench of bed No. 3, on the first level gangway, 700 feet east of the cross tunnel from the Muldoon bed in the Ford mine. The bed contains four partings. Because of the difficulty of separating the upper three partings by picking and washing, one-half of the upper parting and the entire parting next below were included in the sample.

Sample 9164 was taken from the lower bench of No. 3 bed at the same point at which 9168 was taken. The lower bench was separated from the upper by 8½ inches of bone. Both benches were worked together in this part of the mine and the bone had to be removed at the bunkers.

Sample 9167 was taken in the Ford mine on the first level gangway on the No. 4 bed, 650 feet east of the cross tunnel from the Muldoon. A thin layer of carbonaceous shale, between the coal and the roof, and pieces of the floor mixed with the coal in mining and had to be removed at the bunkers.

Sample 9170 was taken in the Bagley mine from the Bagley No. 1 bed on the first water-level gangway at the entrance to the rock tunnel from the Bagley No. 2 bed to the Muldoon bed. This bed was not being worked at the time of sampling.

Sample 9171 was taken in the Bagley mine from the upper bench of the Bagley No. 2 bed, 36 feet up chute No. 24 of the first water level. A thin layer of carbonaceous shale between the bed and the roof broke down with the coal in mining and had to be removed at the bunkers.

Sample 9169 was taken in the Bagley mine from the lower bench of the Bagley No. 2 bed at the same place from which sample 9171 was taken. The 5½-inch parting of shale had to be removed from the coal, as both benches were worked together.

Notes.—The coal has a slightly banded structure. It slacks a little when exposed directly to the sun, but withstands transportation in closed cars for a considerable distance.

At the time the samples were taken the coal from all the beds was passed over bar screens. The oversize was picked by hand and sold as steam and domestic fuel. The undersize was washed in a tub washer.

For chemical analyses of this coal see part I of this bulletin, pp. 203, 204.

CUMBERLAND. INDEPENDENT MINE.

Sample.—Bituminous coal; analyses Nos. 9474, 9286 (p. 204).

Mine.—Independent; a slope mine in the SW. ¼ sec. 28, T. 21 N., R. 7 E., 1 mile south of Cumberland.

Coal bed.—The bed dips 55° SE. In 1910 a slope had been sunk only about 20 feet, and the sections given below were taken in 1909 by E. E. Smith at the foot of this slope.

Sections of coal bed in Independent mine, 1 mile south of Cumberland.

Laboratory No.	9474		9286	
Roof, black carbonaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal, bony	3	5	..	..
Coal	..	..	2	2½
Coal, bony	..	..	1	2½
Covered[a]	..	..	1	2½
Floor, black, carbonaceous shale.				
Thickness of bed	3	5	4	7½
Thickness of coal sampled	3	5	3	5

[a] Not included in sample.

Sample 9474 was taken from the upper bench, and sample 9286 from the lower bench. About 14 inches of the lower part of the lower bench could not be sampled. Both the roof and the floor of the bed are firm.

Notes.—The coal from the upper bench does not weather when exposed to the air. It is noncoking, and resembles the coal from the No. 5 bed at Ravensdale. The upper part of the coal from the lower bench seems to be better than any of the other layers in this bed.

For chemical analyses of this coal see part I of this bulletin, p. 204.

CUMBERLAND. SUNSET MINE.

Sample.—Bituminous coal; analyses Nos. 9263, 9264, 9265, 9276 (pp. 204, 205).

Mine.—Sunset; in the SE. ¼ sec. 28, T. 21 N., R. 7 E., 1 mile southeast of Cumberland. The mine bunkers are on the Northern Pacific Railway, about 1 mile from the mine.

Coal beds.—Three coal beds are exposed. No. 1, the highest in the series, had been worked by a gangway which at the time of sampling had been abandoned and closed. The No. 2 and No. 3 beds are benches of a lower bed. This bed varies in thickness within short distances, and the partings are somewhat irregular. The No. 7 bed outcrops farther on the hill, several hundred feet lower in the series. The beds dip 42 to 60° SE. The No. 2 and No. 3 beds were the only beds worked in 1910.

The beds in the mine were measured and sampled in 1909, by E. E. Smith, as described below:

Section of No. 1 coal bed in Sunset mine, 1 mile southeast of Cumberland.

Laboratory No	9263	
Roof, shale.	*Ft.*	*in.*
Coal, bony [a]	0	7
Coal	4	8½
Floor, bony coal.		
Thickness of bed	5	3½
Thickness of coal sampled	4	8½

[a] Not included in sample.

Section of No. 2 coal bed in Sunset mine, 1 mile southeast of Cumberland.

Laboratory No	9264	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal	1	6½
Shale [a]	0	1
Coal	0	8½
Shale, carbonaceous, soft, black [a]	0	2½
Coal, bony	0	9½
Thickness of bed	3	4
Thickness of coal sampled	3	½

[a] Not included in sample.

Section of No. 3 coal bed in Sunset mine, 1 mile southeast of Cumberland.

Laboratory No	9265	
Roof, soft shale.	*Ft.*	*in.*
Coal	1	3½
Sand, brown [a]	0	1
Coal	1	0
Shale, carbonaceous [a]	0	1½
Clay [a]	0	3
Sandstone, carbonaceous [a]	0	3½
Coal [a]	0	4
Coal, bony [a]	0	4
Thickness of bed	3	8½
Thickness of coal sampled	2	3½

[a] Not included in sample.

Section of No. 7 coal bed in Sunset mine, 1 mile southeast of Cumberland.

Laboratory No	9276
	Ft. in.
Roof, bone.	
Coal, bony	2 0
Shale, black, carbonaceous[a]	0 2½
Coal	0 6
Coal, bony	0 11
Coal, bony	2 5
Floor, bone with some coal.	
Thickness of bed	6 ½
Thickness of coal sampled	5 10

[a] Not included in sample.

Sample 9263 was taken from the side of an air chute on bed No. 1, about 30 feet down the dip from the surface. The coal had been exposed to the atmosphere a long time and was somewhat weathered. The bed lies between two layers of bony coal.

Sample 9264 was taken from bed No. 2 about 1,450 feet from the entrance to the gangway.

Sample 9265 was taken at the same place as sample 9264, but from bed No. 3. Between this bed and the No. 2 bed is a layer of soft shale, part of which can be removed in the mine and the rest at the bunkers. The bed is underlain with about 16 inches of shale and more or less impure coal, pieces of which may be mixed with the coal in mining.

Sample 9276 was taken from bed No. 7, 30 feet from the entrance to the tunnel.

Notes.—The sample taken from the No. 1 bed contained considerable moisture, perhaps because of weathering. The coal from the No. 2 and the No. 3 beds shows fair coking tendencies and was sometimes used as blacksmith coal. The partings were separated from the coal by picking and washing.

For chemical analyses of this coal see part I of this bulletin, pp. 204, 205.

CUMBERLAND. ROSE-MARSHALL MINE.

Sample.—Bituminous coal; analyses Nos. 9293, 10512 (p. 205).

Mine.—Rose-Marshall; a slope mine in the NE. ¼ sec. 29, T. 21 N., R. 7 E., 1 mile west of Cumberland, on a proposed extension of the Northern Pacific Railway.

Coal bed.—The bed is one of the series which is supposed to be the same as that mined at Franklin and Black Diamond. Dip, about 60° W.

The bed was measured and sampled by G. W. Evans in April, 1910, as described below:

Section of coal bed in Rose-Marshall mine, 1 mile west of Cumberland.

Laboratory No	10512
	Ft. in.
Roof, shale.	
Coal, with layers of bone and clay[a]	5 0
Coal	1 1
Shale, carbonaceous[a]	0 2
Coal, cubical fracture	5 0
Floor, bony coal.	
Thickness of bed	11 3
Thickness of coal sampled	6 1

[a] Not included in sample.

Sample 10512 was taken 500 feet down the slope from the surface.

Sample 9293 was taken from lumps of coal stacked near the entrance to the slope. The coal was bright and fresh. The sample was taken by E. E. Smith in 1909.

Notes.—Tipple for cleaning the coal had not been erected at the time of sampling. The coal is pitch black with a dark-brown streak, and its heating value compares favorably with that of many of the bituminous coals of the east.

For chemical analyses of this coal see part I of this bulletin, p. 205.

CUMBERLAND. NAVAL MINE.

Sample.—Bituminous coal; analyses Nos. 9284, 9285, 9287 (p. 205).

Mine.—Naval; water-level and slope mine in the SE. ¼ NW. ¼ sec. 28, T. 21 N., R. 7 E., at Cumberland, on the Northern Pacific Railway.

Coal bed.—One bed of coal was worked. Two benches are numbered in descending order as bed No. 4 and bed No. 6. About 12 feet of carbonaceous shale is between them.

The beds were measured and sampled by E. E. Smith in 1909, as described below:

Section of No. 4 coal bed in Naval mine at Cumberland.

Laboratory No	9287	
Roof, shale and bone.	*Ft.*	*in.*
Coal	0	11
Shale [a]	0	½
Coal	1	6
Floor, shale.		
Thickness of bed	2	5½
Thickness of coal sampled	2	5

Section of No. 6 coal bed in Naval mine at Cumberland.

Laboratory No	9284, 9285	
Coal, hard, bony.	*Ft.*	*in.*
Coal, fat, bony [a]	1	7
Coal [b]	2	4
Coal, bony.		
Thickness of bed	3	11

[a] Included in sample 9284. [b] Included in sample 9285.

Sample 9287 was taken from No. 4 bed at first crosscut above water-level gangway in a chute 144 feet north of the rock tunnel. The bed is overlain with about 7 inches of shale and bone which tends to mix with the coal in mining. The shale floor is firm.

Sample 9285, taken from the north gangway about 330 feet from the rock tunnel, included 1 foot 7 inches of fat bony coal in the upper bench of bed No. 6.

Sample 9284, taken from the same place as sample 9285, included 2 feet 4 inches of coal in the lower bench.

Notes.—The coal from No. 4 bed and from the upper and lower benches of No. 6 bed does not weather when exposed to the air. The coal from No. 4 bed and from the upper bench of No. 6 bed cokes, and the coal from the lower part of No. 6 bed should make fairly good coke. In 1909 no attempt was made to separate any of the impurities in the mine. The coal was picked at the dump house over 2-inch bar screens.

For chemical analyses of this coal see part I of this bulletin, p. 205.

DANVILLE JUNCTION. DANVILLE MINE.

Sample.—Subbituminous coal; analysis No. 9323 (p. 205).

Mine.—Danville; water-level mine in the SW. ¼ sec. 24, T. 22 N., R. 6 E., at Danville Junction, on a spur of the Columbia & Puget Sound Railroad.

Coal bed.—Not named. Dip, 75° SE. About 7 inches of rather soft shale overlies the upper bench of coal and a layer of carbonaceous shale underlies the bed. Where these were exposed in the mine they were soft and broken.

The bed was measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed in Danville mine at Danville Junction.

Laboratory No	9323	
Roof, shale.	*Ft.*	*in.*
Coal, broken and seemingly dirty [a]	1	11
Coal, good	2	2½
Coal, broken and seemingly dirty	3	9
Floor, yellow, slightly carbonaceous shale.		
Thickness of bed	7	10½
Thickness of coal sampled	5	11½

[a] Not included in sample.

The sample was taken 20 feet from the end of the rock tunnel, 20 feet southwest of the fan. The mine had been worked for more than a year, and a good sample could hardly be obtained.

Note.—The coal slacks slightly when exposed to the sun, but withstands shipment in closed cars.

For chemical analyses of this coal see part I of this bulletin, p. 205.

FRANKLIN. PROSPECT.

Sample.—Bituminous (?) coal; analysis No. 9487 (p. 205).

Location.—A prospect in sec. 19, T. 21 N., R. 7 E., on the south bank of Green River, about ¾ mile southwest of Franklin.

Coal bed.—Believed to be the same as the Gem, which is worked at Franklin. A prospect entry had been driven about 70 feet at the time of sampling. The bed dips 60° W.

The bed was measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed in prospect at Franklin.

Laboratory No	9487	
	Ft.	*in.*
Coal, minutely jointed [a]	0	5
Coal, cubic fracture [a]	0	8½
Coal, bony [a]	0	1
Bone, with thin stringers of coal [a]	0	5
Shale, with thin layers of bone and coal [a]	0	8½
Shale, black, with layers and stringers of coal [a]	1	2½
Coal, bony [a]	1	2½
Coal	2	8½
Floor, shale, black carbonaceous.		
Thickness of bed	7	5½
Thickness of coal sampled	2	8½

[a] Not included in sample.

The sample was taken from a prospect hole.

Notes.—The coal is slightly banded and has an irregular fracture. It is considered noncoking, and seemingly should be classed as either a high-grade subbituminous or a low-grade bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 205.

FRANKLIN. OUTCROP.

Sample.—Bituminous coal; analysis No. 9484 (p. 205).

Location.—Outcrop; in sec. 19, T. 21 N., R. 7 E., at Franklin, across Green River from the old Sullivan mine.

Coal bed.—Known as the McKay. It dips about 52° W.

The bed was measured and sampled by E. E. Smith in 1909, the sample being taken from a 4-foot 3½-inch cut of coal.

Notes.—The coal is considered noncoking and is considered a high-grade, bituminous coal.

For chemical analyses of this coal see part I of this bulletin, p. 205.

FRANKLIN. GEM MINE.

Sample.—Bituminous coal; analysis No. 9103 (p. 205).

Mine.—Gem; a slope mine in sec. 19, T. 21 N., R. 7 E., ½ mile southwest of Franklin, on the Columbia & Puget Sound Railroad.

Coal bed.—Known as the Gem. It lies about 500 feet stratigraphically above the McKay bed at Franklin. Dip, 55° W.; thickness, variable, the main bench being 2½ feet to 4 feet thick. Roof and floor, carbonaceous shale or bony coal.

The bed in this mine was measured and sampled in 1909–10. The sample included 3 feet 6½ inches of coal. Taken from a point 10 feet up chute 9. Both the hanging wall and foot wall are firm in this part of the mine, but in other parts of the mine they became mixed to some extent with the coal in mining. The coal is pitch black; does not slack like other coals in the vicinity; is considered noncoking.

Notes.—Because of the high dip, separation of impurities during mining is difficult. Pieces of bone and shale from the hanging and foot walls and the "niggerheads" were removed at the bunkers by hand picking.

For chemical analyses of this coal see part I of this bulletin, p. 205.

GRAND RIDGE. GRAND RIDGE MINE.

Sample.—Subbituminous coal; analyses Nos. 8544, 8545, 9883 (p. 205).

Mine.—Grand Ridge; a slope mine in the SE. ¼ NW. ¼ sec. 26, T. 24 N., R. 6 E., ¼ mile north of Grand Ridge and 3 miles east of Issaquah, on the Northern Pacific Railway.

Coal bed.—Two coal beds were being worked, the lower, or No. 1, and the upper, or No. 2. They have a strike of N. 34° E. and a dip of 28° NW.

The beds were measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed No. 1 in Grand Ridge mine, ¼ mile north of Grand Ridge.

Laboratory No	8544	
Roof, shale.	*Ft.*	*in.*
Coal	1	3½
Shale[a]	0	2½
Coal	1	0
Shale[a]	0	½
Coal	1	0
Shale[a]	0	1
Coal	1	8½
Shale[a]	0	½
Coal	1	7
Floor, shale.		
Thickness of bed	6	11½
Thickness of coal sampled	6	7

[a] Not included in sample.

Section of coal bed No. 2 in Grand Ridge mine, ¼ mile north of Grand Ridge.

Laboratory No	8545	
Roof, compact shale.	*Ft.*	*in.*
Shale and coal in streaks[a]	0	5
Coal	2	0
Coal, banded	2	0
Floor, shale.		
Thickness of bed	4	5
Thickness of coal sampled	4	0

[a] Not included in sample.

Sample 8544 was taken from the north gangway about 220 feet north of the rock tunnel to No. 2 bed. The roof and the floor were fairly strong there and did not become mixed with the coal in mining.

Sample 8545 was taken from the north end of the north gangway on the first water level, about 100 feet north of rock tunnel from No. 1 bed. Both the roof and the floor were firm and did not become mixed with the coal.

Sample 9883 was from the surface of a 50-ton bin of washed coal.

Notes.—The coal from both beds was mixed in the bunkers. The coal that passed over 1½-inch bar screens was hand picked and sold as lump. The coal that passed through the screens was washed. This coal does not contain enough moisture to cause noticeable slacking during shipment in closed cars. The coal makes a good fire in stationary boilers without forced drafts.

For chemical analyses of this coal see part I of this bulletin, p. 205.

ISSAQUAH. ISSAQUAH MINE.

Sample.—Subbituminous coal; analyses Nos. 8542, 8543 (p. 205).

Mine.—Issaquah; slope and drift mine in the SE. ¼ NE. ¼ sec. 33, T. 24 N., R. 6 E., ½ mile southwest of Issaquah, on the Northern Pacific Railway.

Coal bed.—Only the "No. 4" and the "No. 5" beds were sampled as the workings were flooded. The beds dip 26° N.

The beds were measured and sampled by E. E. Smith in 1909, as shown below:

Section of No. 4 coal bed in Issaquah mine, ½ mile southwest of Issaquah.

Laboratory No	8542	
Roof, shale.	*Ft.*	*in.*
Coal	0	11½
Shale [a]	0	½
Coal	1	0
Shale [a]	0	½
Coal	0	5
Shale, with streaks of coal [a]	0	1
Coal	0	7
Shale [a]	0	½
Coal	1	9
Thickness of bed	4	11
Thickness of coal sampled	4	8½

[a] Not included in sample.

Section of No. 5 coal bed in Issaquah mine, ½ mile southwest of Issaquah.

Laboratory No	8543	
Roof, sandstone.	*Ft.*	*in.*
Coal	1	0
Clay [a]	0	5
Coal	2	0
Clay [a]	0	2½
Coal	0	11
Floor, carbonaceous shale.		
Thickness of bed	4	6½
Thickness of coal sampled	3	11

[a] Not included in sample.

Sample 8542 was taken from a small entry west of the main slope on No. 4 bed 50 feet from the entrance to the mine. Although the roof had been exposed to the weather for a long time it appeared to be firm and strong. The sample was wet.

Sample 8543 was taken at the end of a 688-foot water-level tunnel on No. 5 bed from near the surface and was wet.

Notes.—The coal was passed over bar screens. The lump coal was picked by hand and the screenings were washed in a tub washer. The coal withstands shipment in closed cars.

For chemical analyses of this coal see part I of this bulletin, p. 205.

ISSAQUAH. SUPERIOR MINE.

Sample.—Subbituminous coal; analyses Nos. 8547, 8548 (p. 206).

Mine.—Superior; a drift mine 1½ miles southwest of Issaquah, SW. ¼ SE. ¼ sec. 32, T. 24 N., R. 6 E., on a spur of the Northern Pacific Railway.

Coal bed.—This bed dips 30° N., and is thought to be the same as the No. 0 bed at the Issaquah mine.

The beds were sampled and measured in 1909 by E. E. Smith, as described below:

Section of main bed in Superior mine at Issaquah.

Laboratory No	8548	
Roof, coal and clay.	*Ft.*	*in.*
Coal, poor	3	7
Sandstone, shaly, very hard. 1 inch to 3½ inches [a]	0	2½
Coal, good	3	0+
Floor, coal.		
Thickness of bed	6	9½+
Thickness of coal sampled	6	7+

[a] Not included in sample.

Section of No. 0 coal bed in Superior mine at Issaquah.

Laboratory No	8547	
	Ft.	*in.*
Coal	1	5
Clay, brown [a]	0	1
Coal	1	1
Clay, yellow [a]	0	4
Coal	0	8½
Thickness of bed	3	7½
Thickness of coal sampled	3	2½

[a] Not included in sample.

Sample 8548 was taken on the first water level, 900 feet from the entrance of the mine and 60 feet up the dip on the west side of the last entry. It represented wet coal. Above the coal are small lenses of clay which come down in the mining and must be separated.

Sample 8547 was taken 60 feet from the entrance of the 75-foot tunnel on bed No. 0. The sample represented wet coal.

Notes.—The coal from these beds weathers slightly on exposure to the sun, but should stand transportation for some distance in closed cars. Temporary bunkers had been installed at the mine. The coal was picked by hand, pending further development.

For chemical analyses of this coal see part I of this bulletin, p. 206.

ISSAQUAH. PROSPECT.

Sample.—Subbituminous coal; analysis No. 9291 (p. 206).

Location.—Prospect; 3 miles north of Issaquah, SW. ¼ SW. ¼ sec. 13, T. 24 N., R. 6 E.

Coal bed.—The coal bed probably belongs to the same group as that exposed at the Grand Ridge mine to the south. It has a strike of S. 73° W. and a dip of 79° NW.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in prospect, 3 miles north of Issaquah.

Laboratory No	9291	
	Ft.	*in.*
Roof, carbonaceous shale.		
Coal, good	3	1
Clay, white, plastic [a]	0	2
Coal, good	2	9
Clay, yellowish, white, plastic [a]	0	3
Coal, bony	0	3½
Floor, slaty, carbonaceous shale.		
Thickness of bed	6	6½
Thickness of coal sampled	6	1½

[a] Not included in sample.

The sample was taken at the bottom of the (53-foot) shaft. The roof and the floor of the bed are good, a carbonaceous shale, and do not mix with the coal in mining.

Note.—The coal contains much moisture and may rapidly crumple on exposure to the sun, but large blocks exposed to the air under cover for several months showed no signs of weathering.

For chemical analyses of this coal see part I of this bulletin, p. 206.

KUMMER. KUMMER MINE.

Sample.—Subbituminous coal; analyses Nos. 9113, 9115 (p. 206).

Mine.—Kummer; a water-level drift in the SE. ¼ NE. ¼ sec. 26, T. 21 N., R. 6 E., on the north bank of Green River, ¼ mile south of Kummer, King County, on the Columbia & Puget Sound Railroad.

Coal bed.—Several beds of coal are exposed. The better beds were worked in conjunction with several layers of clay which were used for making brick and terra cotta. The two coal beds sampled dip about 40° E.

The two beds were measured and sampled in 1909 by E. E. Smith, as described below:

Section of No. 1 coal bed in Kummer mine, ¼ mile south of Kummer.

Laboratory No	9113	
	Ft.	*in.*
Roof, black carbonaceous shale.		
Coal, good bright	3	8½
Shale, brown, soft [a]	0	1
Coal, good bright	0	5
Floor, shale.		
Thickness of bed	4	2½
Thickness of coal sampled	4	1½

[a] Not included in sample.

Section of lower coal bed in Kummer mine, ¼ mile south of Kummer.

Laboratory No	9115	
	Ft.	*in.*
Coal, slightly bony	0	9
Shale, hard, black, carbonaceous	0	½
Coal, good	0	3½
Shale, black, carbonaceous [a]	0	3
Coal, hard, containing some bony layers,	2	9½
Floor, hard, black, carbonaceous shale.		
Thickness of bed	4	1½
Thickness of coal sampled	3	10½

[a] Not included in sample.

Sample 9113 was taken from the north side of the chute, about 1,500 feet north of the entrance way on No. 1 bed and about 60 feet up the dip. The shale roof and floor became mixed with the coal in mining. This was the only bed worked at time of sampling.

Sample 9115 was taken from the lower bed from the side of a cross tunnel between the upper and lower clay beds about 100 feet to the south of the entrance to the gangway of No. 1 bed. This sample contained much bony coal and many thin layers of hard black shale, which can not be easily separated from the good coal. The coal is underlain with hard black carbonaceous shale which does not part readily from the lower bench.

Notes.—At the time of sampling the impurities were not separated from the coal in the mine. At the bunkers the coal was picked to remove shale that had broken from the roof and floor. The coal was used for the manufacture of brick and was not cleaned as well as for sale in the open market. The coal of the No. 1 bed crumbles when exposed directly to the sun, but withstands shipment in closed cars to considerable distances. It is a high-grade subbituminous coal and its heating value is somewhat higher than that of any of the other subbituminous coals sampled in the State. It also contains more fixed carbon than any of the other subbituminous coals, and more than the McKay coal, which is considered a high-grade bituminous coal.

The coal from the other bed weathers when exposed to the direct rays of the sun. It had been used as boiler fuel at the mine plant. It is a high-grade subbituminous coal but has a high percentage of ash.

For chemical analyses of this coal see part I of this bulletin, p. 206.

PALMER JUNCTION. HUDSON PROSPECT.

Sample.—Bituminous coal; analyses Nos. 9288, 9482 (p. 206).

Location.—Hudson prospect; in the NE. ¼ NE. ¼ sec. 14, T. 21 N., R. 7 E., at Palmer Junction, on the Northern Pacific Railway.

Coal bed.—This coal bed appears to belong to the series exposed at Durham to the north and at the Big Six mine to the south. It dips 38° E., and has a total thickness of 30 feet 3¾ inches. At the time of sampling a tunnel had been driven about 160 feet in the upper part of the bed.

Samples were collected by E. E. Smith in 1909 from two places in the bed, as shown below:

Thickness of coal and shale layers in sampled section of Hudson prospect at Palmer Junction.

Laboratory No.	9288		9482	
	Ft.	*in.*	*Ft.*	*in.*
Shale, carbonaceous, with stringers of coal [a]	0	5	1	0
Coal, bony, with stringers and lenses of good coal	..	..	1	4
Coal, fat, bony	1	3½	..	..
Shale, brown, carbonaceous [a]	..	..	0	3½
Shale, hard, gray [a]	0	1	..	..
Coal [a]	..	..	0	1
Coal, fat, bony	0	8½	..	..
Shale, brown [a]	..	..	0	5
Shale, gray [a]	0	1	..	..
Thickness of coal bed	2	7¼	3	1½
Thickness of coal sampled	2	0	1	4

[a] Not included in sample.

The samples were taken from the surface of the bed just above the entrance to the tunnel, after about 6 inches of the coal had been removed.

Sample 9288 was taken from the upper bench.

Sample 9482 was taken from the lower bench.

Note.—The coal from these two benches does not weather when exposed to the sun.

For chemical analyses of this coal see part I of this bulletin, p. 206.

PRESTON. PROSPECT.

Sample.—Semibituminous coal; analysis No. 8546 (p. 206).

Location.—Prospect in the Tiger Mountain district, 1 mile southwest of Preston, sec. 31, T. 24 N., R. 7 E.

Coal bed.—The bed is poorly exposed and its relation to other beds of the vicinity is not known. The bed was measured and sampled by E. E. Smith in 1909. The sample represented a 3-foot cut; it was taken from the bench of crushed coal here exposed.

For chemical analyses see part I of this bulletin, p. 206.

PRESTON. PROSPECT.

Sample.—Bituminous coal; analyses Nos. 9289, 9290 (p. 206).

Location.—Prospect; in the Tiger Mountain district, in the SE. ¼ SW. ¼ sec. 12, T. 23 N., R. 6 E., 3 miles southwest of Preston and 6 miles southeast of the Northern Pacific Railway at Issaquah.

Coal beds.—The relation of the beds to those in other parts of the county is not definitely known. The beds are broken by faults and by intrusions of igneous rock. They dip about 44° NW.

The beds were measured and sampled by E. E. Smith in 1909, as shown below:

Sections of coal beds in prospect, 3 miles southwest of Preston.

Laboratory No.	9290	
Roof, slaty shale.	*Ft.*	*in.*
Coal	2	2
Clay, dark, plastic [a]	0	2
Coal	1	8½
Clay, white, plastic [a]	0	11
Coal, dirty [a]	0	11
Clay, shaly [a]	0	3
Floor, massive, white sandstone.		
Thickness of bed	6	1½
Thickness of coal sampled	3	10½

[a] Not included in sample.

Sections of coal beds in prospect, 3 miles southwest of Preston—Continued.

Laboratory No	9289	
	Ft.	*in.*
Roof, carbonaceous shale.		
Coal	0	4
Shale, brown, soft [a]	0	3
Coal	0	2
Pyrite [a]	0	1
Coal	0	9
Clay, brown [a]	0	2
Coal	0	6
Clay [a]	0	1
Coal	0	4
Clay, sandy [a]	0	2
Coal [a]	0	6
Floor, massive, white sandstone.		
Thickness of bed	3	4
Thickness of coal sampled	2	1

[a] Not included in sample.

Sample 9290 was taken from the larger and better of the two beds. The coal was badly broken.

Sample 9289 was taken at a point a short distance from the place where No. 9290 was taken.

Notes.—The coal represented by sample 9290 is pitch black with a black streak. It compares favorably in heating value with the average bituminous coal of the State. The other coal has a brown streak and shows a larger percentage of sulphur. Both coals should be classed as bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 206.

RAVENSDALE. MCKAY MINE.

Sample.—Bituminous coal; analyses Nos. 9279, 9280, 9281, 9282, 9283 (p. 207).

Mine.—McKay; a slope mine in the NE. ¼, sec. 1, T. 21 N., R. 6 E., at Ravensdale, on the Northern Pacific Railway.

Coal bed.—The bed worked is known as the McKay and is thought to be the same as the McKay bed of Black Diamond. The dip is 40 to 70° W. The bed contains two benches of clean coal separated by nearly 3 feet of shale and bony coal. The upper bench is nearly uniform in thickness where exposed in the mine, as is the parting. The lower bench is from a little over 5 feet to nearly 6 feet thick. In places this bench contains, near the bottom, a layer of rather bony coal, which was mined.

The bed was measured and sampled by E. E. Smith in 1909, as described below:

Sections of coal bed in McKay mine at Ravensdale.

Laboratory No	9279		9280		9281		9282		9283	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.										
Coal	4	8½	5	0	5	0	[a] 3	2½	3	2½
Coal bony	..	..	..	..	..	..	1	9½	[a] 1	9½
Shale, carbonaceous	..	..	..	..	[b] 0	2½	[a] 0	8½	[a] 0	8½
Floor, shale.										
Thickness of bed	4	8½	5	0	5	2½	5	8½	5	8½
Thickness of coal sampled	4	8½	5	0	5	1¼	1	9½	3	2½

[a] Not included in sample.

[b] 1¼ inches included in sample.

All these samples were taken from the first level.

Sample 9279 was taken from the north end of the north gangway about 300 feet north of the main slope. Both floor and roof are fairly firm and were not mixed with the coal in mining.

Sample 9280 was taken at the north end of the south gangway, about 500 feet north of the entrance. The entire bench is clean coal and separates from both the roof and the floor in mining.

Sample 9281 was taken from the south end of the south gangway about 36 feet beyond chute No. 26. The bed contains about 2½ inches of carbonaceous shale at the bottom, which was not entirely separated in mining. About one-half of this was included in the sample. The sample was slightly moist.

Sample 9282 was taken at the same place as 9281, from a layer of bony coal between the two main benches, to determine whether the layer contained enough carbonaceous matter to be of value in the manufacture of gas if the entire bed were worked.

Sample 9283 was taken from the upper bench of the McKay bed at the place in the mine where 9281 was taken. The bench is clean and separates freely from both the roof and the floor, but was not mined except along the gangway.

Notes.—The coal from the upper bench does not crumble when exposed to the sun. It is a noncoking bituminous coal that compares favorably with many of the noncoking coals from the eastern part of the United States. The main bed is so clean that the coal does not need cleaning except when the upper coal is taken down in driving gangways; the parting must then be separated.

For chemical analyses of this coal see part I of this bulletin. p. 207.

RAVENSDALE. RAVENSDALE NO. 1 MINE.

Sample.—Bituminous coal; analyses Nos. 9266, 9267, 9270, 9271, 9272, 9273, 9274, 9277, 6487 (p. 207).

Mine.—Ravensdale No. 1; in the NE. ¼ sec. 36, T. 22 N., R. 6 E., a slope mine at Ravensdale, on the Northern Pacific Railway.

Coal bed.—Three beds are worked, Nos. 3, 4, and 5. Bed No. 9 had been tapped by a rock tunnel. All the beds dip 22° to 40° W. Both the main and the auxiliary slope were on bed 5, and a rock tunnel about 200 feet in length connected No. 5 with Nos. 3 and 4. Beds Nos. 3 and 4 are separated by about 10 feet of carbonaceous shale and impure coal.

The beds were measured and sampled in October, 1909, except sample 6487, which was taken in 1908 by J. B. Umpleby, as described below:

Section of No. 3 coal bed in Ravensdale No. 1 mine at Ravensdale.

Laboratory No	9266	
	Ft.	*in.*
Roof, shale.		
Coal, bony [a]	0	4
Coal (containing niggerheads)	2	0
Sulphur [a]	0	1
Coal	2	2½
Shale and bony coal [a]	0	8½
Coal	0	8
Shale [a]	0	¼
Coal (sulphur band near center)	2	2½
Floor, hard carbonaceous shale.		
Thickness of bed	8	2¾
Thickness of coal sampled	6	2

[a] Not included in sample.

Section of No. 4 coal bed in Ravensdale No. 1 mine at Ravensdale.

Laboratory No	9267	
	Ft.	*in.*
Roof, shale.		
Coal	3	7
Shale, irregular [a]	0	½
Coal	2	0
Floor, yellowish white clay.		
Thickness of bed	5	7½
Thickness of coal sampled	5	7

[a] Not included in sample.

Sections of No. 5 coal bed in Ravensdale No. 1 mine at Ravensdale.

Laboratory No.	9270		9271		9272		9273		9274	
Roof, shale; No. 9274, black clay.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	3½	3	2½	..	..	..	..	1	0
Coal, bony	..	..	1	2½	..	..	..	..	..	..
Shale, sandy brown	0	½	[a] 0	6	..	..	..	..	..	..
"Sulphur" band and coal	..	..	..	..	..	..	..	..	[a] 0	1
Coal	0	3½	4	2½	..	..	..	..	1	7
Shale, brown	0	¼	[a] 0	1	..	..	..	..	[a] 0	1
Coal	0	5	..	..	..	..	..	..	0	2
Coal, dirty	..	..	1	5	3	2½	..	..	..	..
Shale, sandy and bone	[a] 0	2	..	..	..	..	..	..	[a] 0	2
Coal	1	1	..	..	..	..	4	2½	1	3½
Bone and bony coal	[a] 0	11	..	..	..	..	..	..	..	..
Shale, sandy	..	..	..	..	..	..	[a] 0	1+	[a] 0	½
Coal	0	2½	..	..	..	..	..	..	..	..
Coal, dirty	..	..	..	..	..	..	1	5	..	..
Bone	[a] 0	1	..	..	..	..	..	..	..	..
Coal	2	0	..	..	..	..	..	..	[a] 0	6+
Clay	[a] 0	1	..	..	..	..	..	..	..	..
Coal (reported to be 3 feet)	2+	0	..	..	..	..	..	..	..	..
Thickness of bed	7+	7¼	10	7½	3	2½	5	8½+	4	11+
Thickness of coal sampled	6	4¼	10	½	3	2½	5	7½	4	½

[a] Not included in sample.

Section of No. 9 coal bed in Ravensdale No. 1 mine at Ravensdale.

Laboratory No.	9277	
	Ft.	*in.*
Coal, bony [a]	1	5
Coal	2	2½
Bone, poor [a]	1	7
Shale, very slightly carbonaceous [a]	1	7
Floor, shale.		
Thickness of bed	6	9½
Thickness of coal sampled	2	2½

[a] Not included in sample.

All the samples were collected on the second level.

Sample 9266 was taken from the face of the east gangway of the No. 3 bed, 775 feet east and 400 feet north of the center of section 36, T. 22 N., R. 6 E. The roof is poor and in many places broke down and became mixed with the coal. The floor is fairly firm.

Sample 9267 was taken from bed No. 4 at a point 100 feet up chute No. 16 of the east gangway.

Sample 9270 was taken from No. 5 bed about 15 feet east of the sump at the foot of the slope. Only the upper part of the bed was exposed.

Sample 9274 was taken from chute 31, about 20 feet up the dip from the east gangway on No. 5 bed. This sample represents the part of the bed which was being worked in that part of the mine.

Sample 9271 was taken from bed No. 5, 150 feet up chute 59 on the east gangway and represents the entire thickness of the No. 5 bed. Sample 9272 was taken at the same place as 9271, but from the upper bench of good coal.

Sample 9273 was taken from the same place but from the lower part of the bench.

Sample 6487 was taken from the lower 7 feet of the No. 5 bed.

Sample 9277 was taken on the No. 9 bed from the east end of the gangway, 100 feet from the rock tunnel from No. 5 bed. The bench sampled lies between two layers of bony coal.

Notes.—In 1909 the partings were not separated from the coal in the mine. At the bunkers the run-of-mine coal was passed over a shaking screen having 2½-inch and ¾-inch perforations. That which passed through the holes was sorted in a revolving screen. The different sizes were cleaned in spiral pickers. The coal from the pickers and from the picking table was mixed in the bunker before shipment. The entire output of the mine was used by the Northern Pacific Railway.

For chemical analyses of this coal see part I of this bulletin, p. 207.

RAVENSDALE. McINTYRE PROSPECT.

Sample.—Bituminous coal; analysis No. 9292 (p. 207).

Location.—McIntyre prospect; a small shaft in the NW. ¼ SE. ¼ sec. 28, T. 22 N., R. 7 E., 3½ miles east of Ravensdale.

Coal bed.—About 5 feet of coal was exposed in the bottom of the shaft at the time of sampling. The bed is disturbed and has a steep dip, probably 80° to 85° S.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in McIntyre prospect, 3½ miles east of Ravensdale.

Laboratory No.	9292	
Roof, shale.	*Ft.*	*in.*
Coal	1	9½
Shale and carbonaceous shale [a]	0	2
Coal	0	9½
Clay [a]	0	¼
Coal	0	5
Shale, carbonaceous [a]	0	2½
Coal	1	5
Coal, bony	0	7
Floor, shale.		
Thickness of bed	5	4¾
Thickness of coal sampled	5	0

[a] Not included in sample.

Sample 9292 was taken about 4 feet below the roof. The bed is overlain with shale which is rather broken and may become mixed with the coal in mining.

For chemical analyses of this coal see part I of this bulletin, p. 207.

RENTON. RENTON MINE.

Sample.—Subbituminous coal; King County field; analyses Nos. 2455 and 2456 (Washington No. 1) and analyses Nos. 9156, 9157, 9158, 9159, 9160, 9161, 9162 (pp. 207, 208).

Mine.—Renton, a slope mine in the Renton district, at Renton, in sec. 19, T. 23 N., R. 5 E., on the Seattle Electric Railway.

Coal beds.—Renton No. 2 and Renton No. 3. The beds dip about 12° SE.

The No. 3 bed was measured and sampled at two points in the mine by M. R. Campbell on October 5, 1905. The bed contained several partings at the points of sampling, but these partings were excluded from the samples.

Sample 2455 represented a 67½-inch cut from an 11-foot bed, and was taken 2,400 feet south of the slope and 4,300 feet from the mouth of the mine.

Sample 2456 represented a 72½-inch cut from a 97-inch bed, and was taken 150 feet from the slope and 2,300 feet from the mouth of the mine.

The beds were also measured and sampled in 1909 by E. E. Smith, as described below:

Section of Renton No. 2 coal bed in Renton mine at Renton.

Laboratory No.	9158	
Shale, brown.	*Ft.*	*in.*
Coal	2	4
Clay [a]	0	2½
Coal	1	5
Shale, brown [a]	0	7
Coal, bony [a]	1	6
Coal [a]	1	1
Clay [a]	0	2
Coal, bony [a]	0	2
Clay [a]	0	6
Coal, bony [a]	0	5
Thickness of bed	8	4½
Thickness of coal sampled	3	9

[a] Not included in sample.

Sections of Renton No. 3 coal bed in Renton mine at Renton.

Laboratory No.	2456		2455	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	7	2	2
Coal, bony [a]	..	..	0	11½
Bone [a]	0	1	..	..
Coal	0	9	0	8½
Shale [a]	..	..	0	1½
Bone [a]	0	2½	..	..
Coal	0	10½	0	6
Shale [a]	..	..	0	1
Bone [a]	1	5	..	..
Coal, bony [a]	..	..	0	11
Coal	0	6	2	3
Bone [a]	0	4	..	..
Coal	1	4	..	..
Thickness of bed	8	1	7	8½
Thickness of coal sampled	6	½	5	7½

[a] Not included in sample.

Sections of lower bench of Renton No. 3 coal bed in Renton mine at Renton.

Laboratory No.	9160		9156		9162	
Shale, brown, slightly carbonaceous.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9½	2	8½	0	10
Coal, bony, and carbonaceous shale [a]	0	5	..	..	..	..
Shale, black [a]	..	..	..	..	0	4
Coal	1	9½	..	..	1	10
Shale, black, carbonaceous.						
Thickness of bench	3	0	2	8½	3	0
Thickness of coal sampled	2	7	2	8½	2	8

[a] Not included in sample.

Sections of upper bench of Renton No. 3 coal bed in Renton mine at Renton.

Laboratory No.	9161		9159		9157	
Shale, clayey.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	8½	2	3½	..	..
Shale, brown	[a] 0	1	[a] 0	1	[a] 0	3½
Coal	0	2½	0	8½	3	6½
Shale, brown	[a] 0	½	[a] 0	2	[a] 0	3½
Coal	0	7	0	8	0	3½
Shale, brown, carbonaceous	[a] 0	½	[a] 0	2½	[a] 0	1½
Coal	1	2	0	5	..	..
Shale.						
Thickness of bench	4	10	4	6½	4	6½
Thickness of coal sampled	4	8	4	1	3	10

[a] Not included in sample.

Sample 9158 was taken from bed No. 2 about 140 feet up the first plane north from the fifth level south. The roof is strong and is not mixed with the coal in mining. The floor is shale and impure coal; it was lifted in the main gangways and entries, and the impurities were thrown in the gob or separated at the bunkers.

Sample 9159 was taken from the upper bench of the No. 3 bed 500 feet north of the main slope on the seventh level. About one-half of the center parting was retained in the sample. The layer of white clay and brown shale above the coal varies from a knife edge to 4 feet in this part of the mine; it frequently fell with the coal and was separated and thrown in the gob.

Sample 9160 was taken from the lower bench of No. 3 bed at the same place as 9159. Between the lower bench and the upper bench is about 1 foot 5 inches of shale, which was separated and thrown in the gob.

Sample 9157 was taken from the upper bench of No. 3 bed at the north end of the gangway of the ninth level north, about 2,900 feet east and 1,300 feet north of main portal of the mine. Above the bench is about 3½ inches of carbonaceous shale, which came down with the coal and had to be separated.

Sample 9156 was taken from the lower bench of No. 3 bed at the same place as 9157. Between the benches is 1 foot 5 inches of shale, which was separated during mining and was thrown in the gob. The coal in samples 9156 and 9157 was slightly moist.

Sample 9161 was taken from the upper bench of No. 3 bed about 600 feet above the sixth level south on plane No. 6 of the new workings. A bed of soft shale lies between the top of the bench and the roof. This shale absorbs moisture and expands upon exposure to the air.

Sample 9162 was taken from the lower bench of the No. 3 bed at the same location as sample 9161. Between the benches is about 3 feet of shale, the upper part of which absorbs moisture and swells when exposed.

Notes.—Because of the low dip the larger partings can be separated in the mine. The coal was mined in benches and the larger partings were thrown in the gob. At the bunkers the coal was passed over a shaking screen with 2-inch and 3-inch perforations. The oversize was picked on the lower end of the screen and on the car. The undersize was washed in a tub washer, screened, and sold in nut, pea, and barley sizes. The coal is rather brittle and slacks slightly when exposed to the sun, but withstands considerable transportation when shipped in closed cars. It is extensively used for power production and also for domestic purposes. The approximate output of the mine in 1906 was 350 tons a day.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 273; Bureau of Mines Bull. 23, pp. 69, 185; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 273; Bureau of Mines Bull. 13, pp. 213, 276.

For chemical analyses see part I of this bulletin, pp. 207, 208; also U. S. Geol. Survey Bull. 332, p. 272.

Renton. Denny-Renton Mine.

Sample.—Subbituminous coal; analyses Nos. 9154, 9155 (p. 208).

Mine.—Denny-Renton, a drift mine in T. 23 N., R. 5 E., at Renton, on the Columbia & Puget Sound, and the Chicago, Milwaukee & Puget Sound Railroads.

Coal bed.—The bed worked at this mine, known as the Renton No. 1, overlies the two beds worked at the Renton mine. It dips 14° E. The bed is worked in two benches.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of lower bench of coal bed at Denny-Renton mine at Renton.

Laboratory No.	9155	
	Ft.	*in.*
Roof, yellow clay.		
Coal	0	11
Shale, clayey [a]	0	3½
Coal, bony [a]	0	5
Coal, bony shale toward top	0	8½
Coal	1	6
Clay [a]	0	2½
Coal, bony [a]	0	3½
Clay, sandy [a]	0	½
Coal [a]	0	5
Clay, sandy [a]	0	1
Coal	2	1
Floor, yellow plastic clay.		
Thickness of bed	6	11½
Thickness of coal sampled	4	6

[a] Not included in sample.

Section of upper bench of coal bed at Denny-Renton mine at Renton.

Laboratory No.	9154	
	Ft.	*in.*
Roof, sandy shale.		
Coal, shaly	0	1
Coal	1	1
Shale [a]	0	1
Coal	1	0
Floor, carbonaceous shale.		
Thickness of bed	2	3
Thickness of coal sampled	2	2

[a] Not included in sample.

Sample 9154 was taken from the gangway, about 300 feet north of the south line of sections 17. The thin layer of shaly coal is separated with difficulty in mining, but this layer and the shale between the two coal beds were not included in the sample.

Sample 9155 was taken at two places on the gangway near the north line of section 20 at 540 feet south and 160 feet west of the north quarter corner of section 20, and at 120 feet south of the same corner. This bench contains three layers of coal separated by clay and by coal which is too thin to be mined economically. Between the upper layer of coal and the top bench of the bed is 2 feet 8½ inches of material which must be removed. Several of the clay layers absorb moisture and swell on exposure.

Notes.—The coal is grayish-black with a reddish-brown streak. It slacks slightly upon exposure. The layers between the coal were separated and thrown into the gob. The coal as it came from the mine was picked at the bunker.

For chemical analyses of this coal see part I of this bulletin, pp. 208, 209.

SNOQUALMIE. NIBLOCK MINE.

Sample.—Bituminous coal; analyses Nos. 10031, 10032, 10033 (p. 209).

Mine.—Niblock, a drift mine 1½ miles southwest of Snoqualmie, on a spur from the Northern Pacific Railway.

Coal beds.—Four coal beds have been worked here at different times. At time of sampling the mine had not been in operation for several years, and beds Nos. 3, 4, and 5 were the only ones sampled. The beds dip rather steeply to the west. No. 4 bed lies about 100 feet stratigraphically above No. 3, and No. 5 bed about 60 feet above No. 4.

The coal beds were measured and sampled by E. E. Smith in 1909, as described below:

Section of No. 3 coal bed in Niblock mine, 1½ miles southwest of Snoqualmie.

Laboratory No	10031	
	Ft.	*in.*
Coal, very finely jointed [a]	1	0
Shale, soft [a]	0	6
Shale and clay, mixed [a]	0	8
Coal, bright, clean	4	0
Floor, carbonaceous shale.		
Thickness of bed	6	2
Thickness of coal sampled	4	0

[a] Not included in sample.

Section of No. 4 coal bed in Niblock mine, 1½ miles southwest of Snoqualmie.

Laboratory No	10032	
	Ft.	*in.*
Roof, shaly sandstone.		
Coal, clean, bright	1	1½
Clay [a]	0	¾
Coal, clean	1	4
Shale, carbonaceous [a]	0	¾
Coal	0	8½
Floor, black carbonaceous shale with coal.		
Thickness of bed	3	3½
Thickness of coal sampled	3	2

[a] Not included in sample.

Section No. 5 coal bed in Niblock mine, 1½ miles southwest of Snoqualmie.

Laboratory No	10033	
	Ft.	*in.*
Bone [a]	0	2
Coal, bright	1	9
Bone [a]	0	1
Coal, clean, bright	0	10
Shale, carbonaceous [a]	0	2
Coal	2	5
Coal, bony [a]	0	4
Coal, soft [a]	0	1
Thickness of bed	5	10
Thickness of coal sampled	5	0

[a] Not included in sample.

Sample 10031 was taken from the main bench of the No. 3 bed about 25 feet up a chute 500 feet from the entrance to the highest level. Pieces of the roof and floor became mixed with the coal in mining and had to be separated before shipment.

Sample 10032 was taken from bed No. 4 on the middle level to the left of the rock tunnel from bed No. 5 to bed No. 3, about 800 feet from the entrance to the tunnel on the No. 5 bed.

Sample 10033 was taken from No. 5 bed at the juncture of the main rock tunnel with the gangway on the coal, at a point about 160 feet from the entrance to the mine.

Notes.—The coal from this mine is pitch black, with a nearly black streak and has a vitreous luster. It crumbles readily, so that the proportion of lump coal is small, but does not slack when exposed to the air. The sample from the No. 5 bed shows a large proportion of ash. Much of this may possibly be removed by suitable washing. The coal has been used for making coke and is considered one of the best coking coals in the State. It has also been used as blacksmith coal. The beds are too highly inclined and the coal too finely jointed and broken to permit the separation of impurities in the mine, consequently the coal was picked and washed at the bunkers. The best washed coal was used at the coking ovens on the property. At the time of inspection a new washery was being installed, and the manufacture of briquets was contemplated.

For chemical analyses of this coal see part I of this bulletin, p. 209.

TAYLOR. DENNY-RENTON MINE.

Sample.—Bituminous coal; analyses Nos. 9172, 519–D, 9173, 9174, 520–D, 518–D, 9175, 9176, (p. 209).

Mine.—Denny-Renton, a tunnel and drift mine at Taylor, in sec. 3, T. 22 N. R. 7 E., on the Columbia & Puget Sound Railroad.

Coal beds.—Five coal beds are exposed in a tunnel to several large shale beds which are mined for making brick and terra cotta. The coal beds were worked to supply the company with fuel. In descending order they are numbered 2, 3, 4, 5, and 6. They dip 60 to 70° S. Intrusions of igneous rock follow the coal or parallel it in the shale or cut across it at irregular angles. Wherever this rock is in contact with the coal the latter is partly altered to natural coke. The rock is somewhat decomposed, and when encountered in the coal beds was used in making brick.

Bed No. 4 is 2 feet 8 inches thick and contains small sulphur balls. The roof is good. The bed was measured and sampled in September, 1909, by E. E. Smith at one point, and sample 520–D was taken by K. M. Way in September, 1908, as described below:

Sections of No. 4 and No. 2 coal beds in Denny-Renton mine at Taylor.

Laboratory No.	9173		9172		519–D	
Roof, compact shale or carbonaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	8½	2	8½	2	3½
Coal, bony[a]	..	..	..	..	0	4
Floor, carbonaceous shale or compact shale.						
Thickness of bed	3	8½	2	8½	2	7½
Thickness of coal sampled	3	8½	2	8½	2	3½

[a] Not included in sample.

Sample 9172 was cut from a point 600 feet west and 700 feet south of east corner of section 3, in chute 29, east gangway.

Sample 519–D was cut from a point 1,500 feet northeast of drift mouth.

Sample 9173 was taken in small crosscut from No. 2 bed, and represented 3 feet 8½ inches of coal, which was underlain with bony coal.

Bed No. 5 is 4 feet thick and contains "sulphur" which can be readily separated by washing. The roof is good. The floor is poor; it got mixed with the coal, but could be separated by washing.

The bed was measured and sampled in September, 1909, by E. E. Smith at one point, and by K. M. Way in September, 1908, at two points, as described on the following page:

Sections of No. 5 coal bed in Denny-Renton mine at Taylor.

Section	A		B		C	
Laboratory No	9174		520–D		518–D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	11	0	5	0	5½
Sulphur ball	[a] 0	3	..	..	..	..
Shale	..	..	0	¼	[a] 0	1
Coal (firm)	1	11	0	5¼	1	1
Shale and sandstone	..	..	[a] 0	1	..	..
Coal	..	..	0	1½	..	..
Rash	..	..	[a] 0	2¼	[a] 0	1½
Coal	..	..	1	11	2	1
Floor, shale.						
Thickness of bed	4	1	3	2¼	3	10
Thickness of coal sampled	3	10	2	11	3	7½

[a] Not included in sample.

Section A (sample 9174) was cut from a point 700 feet west and 700 feet south of east corner of section 3, in chute 27, 45 feet above east gangway.

Section B (sample 520–D) was cut from a point 3,000 feet northeast of the drift mouth.

Section C (sample 518–D) was cut from a point 2,400 feet northeast of the drift mouth.

Section of No. 3 coal bed in Denny-Renton mine at Taylor.

Laboratory No	9176	
Roof, shale, carbonaceous.	*Ft.*	*in.*
Coal, slightly bony	0	6
Shale, brown, hard [a]	0	1
Coal, one-third badly squeezed	0	8½
Shale, hard [a]	0	2½
Coal, lime in joints	0	11
Shale, brown [a]	0	1
Coal	1	3½
Floor, carbonaceous shale.		
Thickness of coal bed	3	9½
Thickness of coal sampled	3	5

[a] Not included in sample.

Sample 9176 was taken at a point 50 feet west of point at which sample 9173 was taken.

Bed No. 6 is 4 feet 8 inches thick. It contains "sulphur" balls and streaks, which should be easily separated by washing. The roof is fairly good. The shale floor is poor and got mixed with the coal on account of the steep dip (60°) of the bed, but most of this shale could be separated by picking and washing.

The bed was measured and sampled in September, 1909, by E. E. Smith, at one point, as described below:

Section of No. 6 bed in Denny-Renton mine at Taylor.

Laboratory No	9175	
Roof, shale	*Ft.*	*in.*
Coal, streaks of sulphur	2	2½
Shale, brown [a]	0	1
Coal, firm	2	5
Floor, shale.		
Thickness of bed	4	8½
Thickness of coal sampled	4	7½

[a] Not included in sample.

Sample 9175 was cut from a point 1,500 feet west and 300 feet south of the east corner of section 3, in chute 5, about 25 feet above east gangway.

Notes.—In 1909 the coal was shot off the solid with black powder. Being friable, it was broken by shooting and by sliding down chutes. The tipple was provided with a washer and with picking tables. All the coal was used by the operating company, though some had been sold. The mine had a capacity of 800 tons per day. The

Columbia & Puget Sound Railroad Company carried the coal to tidewater at Seattle, where connection was made with the Northern Pacific Railroad Company, which had bunkers of 2,600 tons capacity, capable of loading 400 tons per hour into vessels.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, pp. 32, 33, 45; coking tests: Bureau of Mines Bull. 5, pp. 32, 33, 45.

For chemical analyses, see part I of this bulletin, p. 209; also Bureau of Mines Bull. 5, p. 14.

KITTITAS COUNTY.[a]

BEEKMAN. BEEKMAN MINE.

Sample.—Bituminous coal; analyses Nos. 9411, 9412, 9413, 9414, 9415, 9459, 550–D, 551–D (pp. 209, 210).

Mine.—Beekman; a slope mine at Beekman, 3 miles northwest of Roslyn, on a spur of the Northern Pacific Railway, SW. ¼ NW. ¼ sec. 12, T. 20 N., R. 14 E.

Coal bed.—Known as the "Roslyn Vein." The bed varies from 4 feet 5 inches to 5 feet 1 inch in thickness. Dip, 8° to 10° S. The bed contains shale, bone, and some "sulphur," irregular and all absent in places. The coal is brighter and more friable than in the other portions of the area. The roof is smooth and exceptionally good. The floor is good and did not get mixed with the coal in mining.

The bed was measured and sampled at five places in November, 1909, by E. E. Smith, as described below:

Sections of coal bed in the Beekman mine at Beekman.

Section	A		B		C		D		E	
Laboratory No.	9411		9412		9413		9414		9415	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3	2	6	1	1¼	2	5	1	3½
Shale, little sulphur	0	¼	..	..	..	..	..	..	0	½
Coal	1	2½	..	..	..	..	..	..	1	2½
Shale, carbonaceous	[a] 0	½	0	1	0	¼	0	½	0	½
Coal	0	3	0	2	..	..	0	3½	0	3
Shale, carbonaceous	0	¼	0	½	..	..	0	½	..	..
Sandstone sulphur band	..	..	..	..	..	..	..	..	0	¼
Coal	0	2½	..	..	..	..	..	..	0	5
Shale, carbonaceous	[a] 0	1	..	..	..	..	..	..	0	¼
Coal	1	8½	1	1½	3	1	1	9½	1	9½
Shale, carbonaceous	[a] 0	1	..	..	[a] 0	1	[a] 0	1	..	..
Shale	..	..	0	1	..	..	..	..	..	..
Coal	0	2½	0	5½	0	2	0	2½	..	..
Floor, carbonaceous or sandy shale.										
Thickness of bed	5	1	4	5½	4	5½	4	10½	5	1
Thickness of coal sampled	4	10½	4	5½	4	4½	4	9½	5	1

[a] Not included in sample.

Section A (sample 9411) was cut from west level on gangway between rooms 26 and 27.

Section B (sample 9412) was cut from east end of level 2.

Section C (sample 9413) was cut from a point 150 feet beyond room 21 on east level 3.

Section D (sample 9414) was cut from west level 3 on gangway between rooms 17 and 18.

Section E (sample 9415) was cut from foot of slope, about 250 feet below the fourth level gangway.

A composite sample was made by mixing samples 9411, 9412, 9413, 9414, and 9415 for a composite sample, the results of which are shown under laboratory number 9459 (p. 210).

The bed was also measured and sampled at two other points in 1908 by K. M. Way, as described on the following page.

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[a] For more detailed descriptions of the coals of Kittitas County, see U. S. Geol. Survey Bull. 374, pp. 129–152.

Sections of coal bed in Beekman mine at Beekman.

Section	A		B	
Laboratory No.	551-D		550-D	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	9½	0	1
Shale, hard [a]	..	¾	..	..
Mother coal	..	..	0	¼
Coal	1	10	2	3
Shale [a]	0	½	0	1
Coal	0	1½	0	4
Shale [a]	..	..	0	¾
Coal	..	..	0	6¼
Shale [a]	..	..	0	¾
Coal	..	..	1	1½
Shale [a]	..	..	0	½
Coal	..	..	0	2
Floor, shale.				
Thickness of bed	4	10¼	4	9
Thickness of coal sampled	4	9	4	6

[a] Not included in sample.

Section A (sample 551-D) was cut from a rib 1,300 feet southwest of the slope, on second level west.

Section B (sample 550-D) was cut from a point 1,000 feet southwest of the slope.

Notes.—The coal is considered a good coking and steam coal. In 1909 it was mined either at the bottom or near the center of the bed, and was shot down with black powder. The tipple was provided with shaking screens with 1¾-inch, and 3-inch holes separating the coal into steam coal, special steam coal, and lump.

The shale and "sulphur" were picked from the coal in mining, but large lumps were not broken to remove the impurities they contained. The two men loading the cars at the tipple picked some of the shale from the car during loading. Only a small proportion of the shale and "sulphur" passed through the screens into the steam coal. The capacity of the mine was 1,000 tons and the average output was 800 tons per day. The output was expected to average about 90 per cent from advance work. The coal was taken by the Northern Pacific Railroad and by the Chicago, Milwaukee & Puget Sound Railroad to Seattle. At Seattle the company owning the mine had bunkers with a capacity of 2,500 tons and capable of loading 500 tons per day into vessels.

For results of washing tests of this coal, see Bureau of Mines Bull. 5, pp. 32, 47.

For chemical analyses see part I of this bulletin, pp. 209, 210; also Bureau of Mines Bull. 5, p. 16.

BEEKMAN. LAKEDALE MINE.

Sample.—Bituminous coal; analysis No. 9405 (p. 210).

Mine.—Lakedale; a water-level mine in sec. 11, T. 20 N., R. 14 E., 1 mile northwest of Beekman, on a spur of the Northern Pacific Railway.

Coal bed.—The coal bed worked in this mine dips 10° S. This bed has been thought to be either the Roslyn or the bed underlying it. It is probably a third bed which is believed to underlie the Roslyn beds farther to the east. The bed was measured and sampled in 1909, by E. E. Smith, as described below:

Section of coal bed in Lakedale mine, 1 mile northwest of Beekman.

Laboratory No.	9405	
Roof, carbonaceous black shale.	*Ft.*	*in.*
Coal, bony near center	1	0
Shale [a]	0	6½
Coal	0	6½
Shale, bony	0	1
Coal	0	7½
Coal, bony	0	¼
Coal	0	9¼
Floor, hard, brown shale.		
Thickness of bed	3	7
Thickness of coal sampled	3	½

[a] Not included in sample.

Sample 9405 was taken 10 feet above the gangway, about 150 feet from the entrance.

Notes.—Both the roof and the floor are firm and did not mix with the coal. The coal does not weather while being transported to market. The partings can be removed to some extent in mining. At the bunker the coal was passed over bar screens and picked.

For chemical analyses of this coal see part I of this bulletin, p. 210.

BEEKMAN. PROSPECT.

Sample.—Bituminous coal; analysis No. 9404 (p. 210).

Location.—Prospect; in sec. 2, T. 20 N., R. 14 E., 1¼ miles northwest of Beekman.

Coal bed.—The bed strikes N. 55° E. and has a dip of 12° SE. It is believed to underlie the other beds of the Roslyn field. It is too thin to be of any commercial importance.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in prospect 1¼ miles northeast of Beekman.

Laboratory No.	9404	
	Ft.	*in.*
Roof, hard shale.		
Coal, good	1	2½
Shale[a]	0	2½
Coal, good[a]	0	2½
Floor, soft shale.		
Thickness of bed	1	7½
Thickness of coal sampled	1	2½

[a] Not included in sample.

Notes.—The sample collected was somewhat weathered. The coal should probably be classed as low-grade bituminous.

For chemical analyses of this coal see part I of this bulletin, p. 210.

CLEALUM. CLE ELUM NO. 1 MINE.

Sample.—Bituminous coal; analyses Nos. 9445, 9446, 9447, 9467 (p. 211).

Mine.—Cle Elum No. 1; shaft mine in sec. 26, T. 20 N., R. 15 E., at Clealum, on the Northern Pacific Railroad.

Coal bed.—Roslyn. The bed is separated by about 3 feet of shale from a massive layer of sandstone. Pieces of shale broke after the coal was mined and were thrown in the gob. The shale occasionally broke with the coal and had to be separated in loading mine cars. The floor was firm and did not mix with the coal. The bed dips 24° to 31° S.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Sections of coal bed in Cle Elum No. 1 mine at Clealum.

Laboratory No.	9445		9446		9447	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal	2	0	1	½	2	5½
Shale[a]	[a] 0	¼	[a] 0	½	0	1
Coal	[b] 0	1	1	2½	0	6
Shale	[a] 0	½	0	½	[a] 0	1
Coal	[b] 0	2	0	3	1	0
Shale	[a] 0	½	[a] 0	1	..	..
Coal	0	5½	0	5½	..	..
Shale, bony	0	½	..	..	..	..
Coal	1	4	..	..	..	..
Shale, bony	0	½	..	..	..	..
Coal	0	2	..	..	..	..
Shale	0	¼	[a] 0	1	..	..
Coal	0	1	1	2½	..	..
Floor, shale.						
Thickness of bed	4	6	4	5	4	1½
Thickness of coal sampled	4	3¼	4	2½	4	½

[a] Not included in sample.

[b] One-half included in sample.

Sample 9445 was taken from the gangway on the first southwest level between rooms 32 and 33.

Sample 9446 was taken from the gangway of the first southwest level, 100 feet from the slope

Sample 9447 was taken at the east end of the gangway on the southeast level.

A composite sample was made by mixing the face samples 9445, 9446, and 9447 for an ultimate analysis, the results of which are shown under laboratory number 9467 (p. 211).

Note.—The coal was used for locomotives and did not need picking at the dump house.

For chemical analyses of this coal see part I of this bulletin, p. 211.

CLEALUM. CLE ELUM NO. 2 MINE.

Sample.—Bituminous coal; analysis No. 9472 (p. 211).

Mine.—Cle Elum No. 2; ½ mile north of Clealum.

Coal bed.—Roslyn. The bed is separated by about 3 feet of shale cap rock from a massive layer of sandstone. Pieces of this shale varying up to a foot in thickness broke off after the coal was mined and were thrown in the gob. They occasionally broke with the coal and had to be separated before the mine cars were loaded. The floor is firm. The bed dips about 14° SW.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Cle Elum No. 2, mine, ½ mile north of Clealum.

Laboratory No	9472	
Roof, soft shale.	*Ft.*	*in.*
Coal	1	1
Sulphur band and coal [a]	0	1
Coal	0	6½
Coal, bony	0	½
Coal	0	7
Shale and coal layers [a]	0	3½
Coal	1	5½
Floor, shale.		
Thickness of bed	4	1
Thickness of coal sampled	3	8½

[a] Not included in sample.

Sample 9472 was taken at the face of the gangway of east level 6.

Notes.—Bony layers in the coal are difficult to separate. All of the coal was used for locomotives and did not need further picking at the dumphouse.

For chemical analysis of this coal see part I of this bulletin, p. 211.

CLEALUM. CLE ELUM NO. 2 EXTENSION MINE.

Sample.—Bituminous coal; analysis No. 9409 (p. 211).

Mine.—Cle Elum No. 2 Extension; an incline and drift mine 1 mile north of Clealum.

Coal bed.—Roslyn bed. Roof and floor as in Cle Elum No. 2 mine. The bed dips 9° S.

The bed was measured and sampled in 1909–10 by E. E. Smith, as described on the following page.

Section of coal bed in Cle Elum No. 2 Extension mine, 1 mile north of Clealum.

Laboratory No	9409	
Roof, slightly carbonaceous shale.	*Ft.*	*in.*
Coal	1	2½
Shale, bony [a]	0	1
Coal	1	3
Shale, bony	0	¼
Coal	0	1½
Shale [b]	0	¾
Coal [b]	0	1
Shale [b]	0	½
Coal	0	4
Shale, bony	0	½
Coal	1	5
Floor, hard shale.		
Thickness of bed	4	8
Thickness of coal sampled	4	4½

[a] One-half included in sample.

[b] Not included in sample.

The sample was taken on the gangway of east level 8, about 50 feet from the rope slope.

Note.—All of the coal was used for locomotives and did not need picking at the dumphouse.

For chemical analyses of this coal see part I of this bulletin, p. 211.

CLEALUM. CLE ELUM NO. 3 EXTENSION MINE.

Sample.—Bituminous coal; analysis No. 9408 (p. 211).

Mine.—Cle Elum No. 3 Extension; an incline and drift mine in sec. 23, T. 20 N., R. 15 E., 1 mile north of Clealum.

Coal bed.—Roslyn. The bed, roof, and floor are as in No. 2 mine. The bed dips about 9° S.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Cle Elum No. 3 Extension mine, 1 mile north of Clealum.

Laboratory No	9408	
Roof, shale.	*Ft.*	*in.*
Coal	2	8½
Shale [a]	0	½
Coal	0	4
Shale, bony	0	1
Coal	1	2½
Floor, shale.		
Thickness of bed	4	4½
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken just below level 6, from the air course which parallels the incline.

Note.—All of the coal was used for locomotives and did not need picking at the dumphouse.

For chemical analyses of this coal see part I of this bulletin, p. 211.

CLEALUM. ROSLYN NO. 7 MINE.

Sample.—Bituminous coal; analyses Nos. 9419, 9420, 9421, 9422, 9461 (p. 211).

Mine.—Roslyn No. 7; a slope mine in sec. 22, T. 20 N., R. 15 E., ½ mile northwest of Clealum, on a spur from the Northern Pacific Railroad.

Coal bed.—Roslyn. Roof and floor as in Cle Elum No. 3 Extension mine. The bed dips 20 to 30° SW.

The bed was measured and sampled in 1909 by E. E. Smith, as described on the following page.

Sections of coal bed in Roslyn No. 7 mine, ½ mile northwest of Clealum.

Laboratory No.	9421		9422		9420		9419	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.								
Coal, broken	..	..	..	..	0	4	..	..
Coal	1	2	1	2	0	10	2	½
Shale	..	..	[a] 0	½	[a] 0	1	[a] 0	1
Sulphur band	[a] 0	½	..	..	..	..	..	..
Coal, streaks of sulphur	..	..	1	6½	..	..	..	..
Coal	1	2½	..	..	1	6½	0	1½
Shale	[a] 0	1	0	½	..	..	0	1
Coal and shale streaks	..	..	..	..	[a] 0	2	..	..
Coal	0	1½	0	2	0	2	..	..
Sulphur band	[a] 0	¼	..	..	..	..	..	..
Coal	[b] 0	1	..	..	..	..	..	..
Shale	0	½	[a] 0	1	0	½	..	..
Coal	0	4	..	..	..	..	..	..
Shale	[a] 0	½	..	..	..	..	0	4
Coal, streaky	..	..	..	..	..	..	0	2
Coal	1	6½	1	6	1	8½	1	6½
Floor, shale.								
Thickness of bed	4	8¼	4	6½	4	10½	4	4½
Thickness of coal sampled	4	5½	4	5	4	7½	4	3½

[a] Not included in sample. [b] One-half included in sample.

Sample 9422 was taken on the gangway of west level 2, 6 feet up room 40.

Sample 9421 was taken on the gangway of east level 2, 15 feet from the barrier between mine No. 7 and mine No. 1 at Clealum. A parting of shale, "sulphur," and coal occurs near the center of the bed. In picking, about one-half of the coal in this parting would be thrown away; hence in sampling only half the coal and the ½-inch band of shale were included in the sample.

Sample 9420 was taken in the air course below the gangway of west level 4, about 800 feet west of the slope.

Sample 9419 was taken on the gangway of east level 4, 330 feet beyond the entrance to room 12.

A composite sample was made by mixing the face samples 9419, 9420, 9421, and 9422. The results of an ultimate analysis are shown under laboratory number 9461 (p. 211).

Note.—All of the coal was used for locomotives and did not need picking at the dumphouse.

For chemical analyses of this coal see part I of this bulletin, p. 211.

CLEALUM. SUMMIT MINE.

Sample.—Bituminous coal; analysis No. 9403 (p. 211).

Mine.—Summit; an incline in sec. 14, T. 20 N., R. 15 E., 1 mile north of Clealum.

Coal bed.—Roslyn. The bed dips 11° S.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Summit mine, 1 mile north of Clealum.

Laboratory No.	9403	
	Ft.	*in.*
Roof, shale with streaks of coal.		
Coal	2	5½
Shale [a]	0	½
Coal	0	2
Shale [a]	0	½
Coal	1	9½
Floor, shale.		
Thickness of bed	4	6
Thickness of coal sampled	4	5

[a] Not included in sample.

The sample was taken 50 feet down the slant from the new tunnel and about 40 feet below the surface.

Note.—At the bunker the coal was passed over 2-inch bar screens, the oversize being picked and marketed as lump coal, and the undersize being sold as steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 211.

ROSLYN. ROSLYN NO. 2 SLOPE MINE.

Sample.—Bituminous coal; analyses Nos. 9433, 9434, 9435, 9436, 9464 (p. 211).

Mine.—Roslyn No. 2 Slope; a drift and slope mine in sec. 20, T. 20 N., R. 15 E., at Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. The bed dips about 12° S. Roof and floor as in Cle Elum No. 3 Extension mine.

The bed was measured and sampled in 1909 by E. E. Smith at four points, as described below:

Sections of coal bed in Roslyn No. 2 Slope mine at Roslyn.

Laboratory No.	9435		9434		9433		9436	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.								
Coal	1	0	..	..	..	..	2	6
Sulphur band mixed with coal	[a] 0	½	..	..	..	..	0	¼
Coal, streaks of sulphur	..	..	1	1	2	6	..	..
Coal	1	3	..	..	..	..	0	1
Shale	[a] 0	½	..	..	[a] 0	1	[a] 0	1
Shale, sulphur band	..	..	Trace.		..	..	..	..
Coal	0	3	..	..	0	3	..	..
Coal, streaks of sulphur	..	..	1	½	..	..	..	..
Shale, soft	0	½	Trace.		[a] 0	1	..	..
Coal	0	3	0	4	..	..	..	..
Shale	[a] 0	½	[a] 0	1	..	..	..	..
Coal	1	0	2	0	1	10	1	6
Shale	0	½	..	..	..	..	..	..
Coal	0	7	..	..	..	..	..	..
Floor, shale.								
Thickness of bed	4	6½	4	6½	4	9	4	2¼
Thickness of coal sampled	4	5	4	5½	4	7	4	1¼

[a] Not included in sample.

Sample 9433 was taken on the fifth level west from slope 2, 250 feet up room 7 of the second block.

Sample 9434 was taken on the sixth level west from slope 2, on the side of the barrier pillar separating this mine from No. 3 mine, and 360 feet up the dip from the gangway.

Sample 9435 was collected on the sixth level west from slope 2, on the gangway between rooms 2 and 3.

Sample 9436 was taken from the side of the slope between the eighth level and the tenth level west from shaft 4, and about 10 feet below the air course below the eighth level.

A composite sample was made by mixing samples 9433, 9434, 9435, and 9436. The results of an ultimate analysis of this sample are shown under laboratory No. 9464 (p. 211).

Note.—The coal was not picked at the bunkers, because it was clean enough for locomotive use.

For chemical analyses of this coal, see part I of this bulletin, p. 211.

ROSLYN. ROSLYN NO. 4 MINE.

Sample.—Bituminous coal; analysis No. 2458 (Washington No. 2), and analyses Nos. 9437, 9438, 9465 (p. 212).

Mine.—Roslyn No. 4; a shaft in sec. 20, T. 20 N., R. 15 E., at Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. The bed dips about 15° S. Roof and floor as in neighboring mines.

The bed was measured and sampled at three points by E. E. Smith on November 16, 1909 (except sample 2458, which was taken on October 12, 1905, by M. R Campbell), as shown on the following page.

Sections of coal bed in Roslyn No. 4 mine at Roslyn.

Laboratory No	9437		9438		2458	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, streaks of sulphur	[a] 0	2½	..	..	..	..
Coal	2	5½	1	3½	1	4½
Shale, containing sulphur	..	..	[a] 0	1	[a] 0	½
Shale	[a] 0	1	..	..	..	..
Coal	0	3	1	5½	1	4
Sulphur band	..	..	0	¼	..	..
Coal	..	..	0	1½	..	..
Parting	..	..	..	..	[a] 0	4
Shale	[a] 0	½	[a] 0	1	..	..
Coal	2	0	2	0	1	9½
Floor, shale.						
Thickness of bed	5	½	5	¾	4	10½
Thickness of coal sampled	4	8½	4	10¾	4	6

[a] Not included in sample.

Sample 9438 was taken from the gangway of west level 11, near the center of the second block.

Sample 9437 was taken from the gangway of east level 11, between rooms 3 and 4 of the second battery.

Sample 2458 was taken from room 3 of the second battery on west level 9, and about 2,000 feet from the base of the shaft.

A composite sample was made by mixing samples 9438 and 9437. An ultimate analysis of this sample is shown under laboratory No. 9465 (p. 212).

Notes.—The coal in the mine is under considerable pressure from the roof and was worked without shooting. The partings and impurities which separate readily from the coal were not loaded in the mine. All the coal was used for locomotives and did not need further picking at the dumphouse.

For results of producer-gas tests of this coal, see Bureau of Mines Bull. 13, pp. 214, 276.

For chemical analyses see part I of this bulletin, p. 212.

ROSLYN. ROSLYN NO. 2 MINE.

Sample.—Bituminous coal; analyses Nos. 2457 (Washington No. 2) and 9442, 9443, 9444, 9468 (p. 212).

Mine.—Roslyn No. 2; an incline in secs. 8 and 9, T. 20 N., R. 15 E., at Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. The lower 2 inches of the shale cap rock breaks after the coal is removed and was thrown in the gob. The remainder forms a good roof throughout most of the mine. The floor of the bed is firm. The bed dips about 12° S.

The bed was measured and sampled at four points by E. E. Smith on November 3, 1909, and by M. R. Campbell on October 12, 1905, as shown below:

Section of coal bed in Roslyn No. 2 mine, at Roslyn.

Laboratory No	9443		9442		9444		2457	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	3½	2	3½	2	3	2	10½
Sulphur band	..	..	..	..	[a] 0	½	..	..
Shale	0	¼	Trace.		..	..	..	..
Parting	..	..	..	..	..	..	[b] 0	¾
Coal	0	2	0	5	0	3½	..	..
Shale, sulphur	Trace.		..	..	..	..	..	..
Shale, bony	..	..	[b] 0	2	[a] 0	¼	..	..
Coal	0	5½	..	..	0	3½	..	..
Shale	0	½	..	..	[a] 0	½	..	..
Coal	1	5	1	3	1	5	1	2¼
Floor, shale.								
Thickness of bed	4	4¾	4	1½	4	4¼	4	1½
Thickness of coal sampled	4	4¾	3	11½	4	3⅝	4	¾

[a] One-half included in sample.

[b] Not included in sample.

Sample 9442 was taken from the eighth level, about 15 feet west of the east rope slope.

Sample 9443 was taken from the seventh level west on the gangway at the entrance to room 80.

Sample 9444 was taken on the tenth level east, 75 feet beyond room 43.

Sample 2457 was collected from a point about 6,000 feet from the entrance to the mine.

A composite sample was made by mixing the face samples 9442, 9443, and 9444. The results of an ultimate analysis of this sample are shown under laboratory No. 9468 (p. 212).

Notes.—The partings and impurities that separate readily from the coal were not loaded in the mine. All the coal was used for locomotives and did not need further picking at the dumphouse.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: Bureau of Mines Bull. 23, pp. 69, 185; producer-gas tests: Bureau of Mines Bull. 13, pp. 214, 276.

For chemical analyses, see part I of this bulletin, p. 212.

ROSLYN. ROSLYN NO. 6 MINE.

Sample.—Bituminous coal; analyses Nos. 9439, 9440, 9441, 9466 (p. 212).

Mine.—Roslyn No. 6; a series of drift mines located in sec. 16, T. 20 N., R. 15 E., ¾ mile southeast of Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. Roof and floor about as in neighboring mines on this bed. The bed dips 7° to 10° S.

The bed was measured and sampled on November 4, 1909, by E. E. Smith at three points, as described below:

Sections of coal bed in Roslyn No. 6 mine, ¾ mile southeast of Roslyn.

Laboratory No.	9439		9440		9441	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal	2	6½	2	3½	..	..
Sulphur band	[a] 0	¼	..	..	..	..
Shale	..	..	[b] 0	1	..	..
Coal	0	1½	0	2½	..	..
Coal lenses of sulphur	..	..	..	..	2	8
Shale	[b] 0	½	0	¼	[a] 0	½
Coal	[a] 0	1½	0	4	0	3
Shale	[b] 0	1	[b] 0	2	[a] 0	1
Coal lenses of sulphur	..	..	..	..	..	..
Coal	1	1	1	8	1	6½
Sulphur band	0	¼	..	..	..	..
Coal	0	6	..	..	..	..
Floor, shale.						
Thickness of bed	4	6½	4	9¼	4	7
Thickness of coal sampled	4	4⅛	4	6¼	4	5½

[a] One-half only sampled.

[b] Not included in sample.

Sample 9439 was taken from the stump pillar between rooms 1 and 2 on the seventh level.

Sample 9441 was taken at the east end of the seventh level.

Sample 9440 was taken from the east end of the fifth level.

A composite sample was made by mixing laboratory samples 9439, 9440, and 9441 for an ultimate analysis, the results of which are shown under laboratory No. 9466 (p. 213).

Notes.—The partings and impurities which separate readily from the coal were not loaded in the mine. All of the coal was used for locomotives and did not need further picking at the dumphouse.

For chemical analyses of this coal, see part I of this bulletin, p. 212.

ROSLYN. A. & E. MINE.

Sample.—Bituminous coal; analysis No. 9402 (p. 213).

Mine.—A. & E.; a drift and slope mine in sec. 10, T. 20 N., R. 15 E., 1 mile northeast of Roslyn.

Coal bed.—Roslyn. Roof and floor about as in neighboring mines. The bed dips 11° S.

The bed was measured and sampled by E. E. Smith in 1909, as described below:

Section of coal bed in A. & E. mine, 1 mile northeast of Roslyn.

Laboratory No.	9402	
	Ft.	*in.*
Roof, soft shale.		
Coal	2	5
Clay [a]	0	½
Coal	0	2½
Shale, black [a]	0	½
Coal	1	8
Floor, dark shale.		
Thickness of bed	4	4½
Thickness of coal sampled	4	3½

[a] Not included in sample.

Notes.—The partings, roof rock, and other impurities that could be readily removed when the mine cars were loaded were thrown in the gob. At the tipple the coal was passed over 3-inch bar screens. The oversize was sold as lump and the undersize as steam coal.

The sample was taken 160 feet up the ninth room from the slope.

For chemical analyses of this coal see part I of this bulletin, p. 213.

ROSLYN. ROSLYN NO. 5 MINE.

Sample.—Bituminous coal; analyses Nos. 9423, 9424, 9425, 9426, 9427, 9462 (p. 213).

Mine.—Roslyn No. 5; a slope mine in sec. 22, T. 20 N., R. 15 E., 1½ miles southeast of Roslyn, on a spur of the Northern Pacific Railway.

Coal bed.—Roslyn. Roof and floor about as in neighboring mines. The bed dips 20° to 30° SW.

The bed was measured and sampled on November 5, 1909, by E. E. Smith, as described below:

Sections of coal bed in Roslyn No. 5 mine, 1½ miles southeast of Roslyn.

Laboratory No.	9426		9427		9424	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Streak of coal	..	..	[a] 0	1	..	..
Coal	1	2	2	6½	1	1
Bone	..	..	..	..	..	..
Sandstone, sulphur band	0	¼	..	..	0	½
Sulphur band	..	..	[a] 0	1	..	..
Coal	1	6	..	..	1	7
Coal, broken	..	..	[a] 0	1	..	..
Sulphur band	0	½	..	..	..	..
Clay	..	..	[a] 0	1	..	..
Coal	0	2	..	..	..	..
Sandstone and sulphur	..	..	..	..	[a] 0	½
Clay, soft	[a] 0	1	..	..	..	..
Coal	0	2	..	..	0	1
Shale	..	..	..	..	[a] 0	½
Coal, bony	0	¼	..	..	..	..
Coal	1	7	1	11	2	5
Floor, shale.						
Thickness of bed	4	8¾	4	9½	5	3½
Thickness of coal sampled	4	7¾	4	5½	5	2½

[a] Not included in sample.

Section of coal bed in Roslyn No. 5 mine, 1½ miles southeast of Roslyn—Continued.

Laboratory No.	9425		9423	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	3	2	8
Irregular sulphur band	Trace.		..	..
Bone	..	..	0	1
Coal	1	2½	0	3
Clay, soft	..	..	[a] 0	½
Sulphur	0	¼	..	..
Coal	0	1½	..	..
Clay	[a] 0	½	..	..
Coal	2	3½	1	8½
Floor, shale.				
Thickness of bed	4	11¼	4	9
Thickness of coal sampled	4	10¾	4	8½

[a] Not included in sample.

Sample 9427 was taken from the barrier pillar between No. 5 mine and the old No. 1 mine, and on the gangway of the first level west of the No. 5 slope. A 3-inch parting of broken coal, clay, and pyrite occurs in the center of the bed. This was not included in the sample.

Sample 9423 was taken from the barrier pillar between mines No. 5 and No. 7, about 10 feet above the second level gangway of mine No. 5.

Sample 9424 was taken on the third level west at the entrance to room No. 50.

Sample 9426 was taken on the third gangway east at entrance to room No. 42.

Sample 9425 was taken from the air course below the fourth level, about 30 feet west from the slope.

A composite sample was made by mixing the five samples 9423, 9424, 9425, 9426, and 9427. An ultimate analysis of this sample is shown under laboratory No. 9462 (p. 213).

Notes.—The partings and impurities that separated readily from the coal were not loaded in the mine. All of the coal was used for locomotives and did not need further picking at the dumphouse.

For chemical analyses of this coal see part I of this bulletin, p. 213.

ROSLYN. PATRICK-MACKAY MINE.

Sample.—Bituminous coal; analyses Nos. 9407, 9416, 9417, 9418, 9460 (p. 213).

Mine.—Patrick-MacKay; a slope in sec. 6, T. 20 N., R. 15 E., 2½ miles northwest of Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. Roof and bed as in near-by mines. Dip, 9° S.

The Roslyn upper bed was measured and sampled in 1909 by E. E. Smith at three points and the lower bed at one point, as described below:

Sections of lower coal bed in Patrick-MacKay mine, 2½ miles northwest of Roslyn.

Laboratory No.	9416		9418		9417	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale or sandstone.						
Coal	1	2	1	3	1	2
Sulphur band	0	¼	0	¼	Trace.	
Coal	1	3	1	1	1	3½
Sulphur band	..	..	Trace.		..	..
Shale, bony	0	¼	..	..	0	½
Coal	0	2½	0	3	0	2
Shale	[a] 0	1	[a] 0	1	[a] 0	1
Coal	1	3½	1	10	1	5½
Floor, shale.						
Thickness of bed	4	½	4	6¼	4	2½
Thickness of coal sampled	3	11½	4	5¼	4	1½

[a] Not included in sample.

Section of lower coal bed in Patrick-MacKay mine, 2½ miles northwest of Roslyn.

Laboratory No	9407	
Roof, shale.	*Ft.*	*in.*
Coal, bony [a]	1	5½
Sandstone [a]	0	1½
Coal	0	8
Shale, hard [a]	0	½
Coal	1	5½
Shale [a]	0	3½
Shale, hard [a]	0	2
Coal [a]	0	9
Floor, shale.		
Thickness of coal bed	4	11½
Thickness of coal sampled	2	1½

[a] Not included in sample.

Sample 9418 was taken on the gangway of the first water level west, at the entrance to room No. 18.

Sample No. 9416 was taken from the west side of the slope, 50 feet above the entrance to the first water level east.

Sample 9417 was taken at the end of the gangway on the first water level east, about 1,000 feet from the rock tunnel to the main slope.

A composite sample was made by mixing the face samples 9416, 9417, and 9418 for an ultimate analysis, the results of which are shown under laboratory No. 9460 (p. 213).

Notes.—The coal was passed over bar screens with ⅞-inch and 1½-inch spaces. The oversize was picked and sold as lump coal, the undersize being sold as steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 213.

ROSLYN. ROSLYN NO. 3 MINE.

Sample.—Bituminous coal; analyses Nos. 9428, 9429, 9430, 9431, 9432, 9463 (pp. 213, 214).

Mine.—Roslyn No. 3; an incline and slope mine in sec. 7, T. 20 N., R. 15 E., 1½ miles west of Roslyn, on the Northern Pacific Railway.

Coal bed.—Roslyn. Roof as in neighboring mines.

The bed was measured and sampled in 1909–10 by E. E. Smith at five points, as described below:

Sections of coal bed in Roslyn No. 3 mine, 1½ miles west of Roslyn.

Laboratory No	9429		9428		9430		9432		9431	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3½	2	3	1	8	1	0	1	3
Sulphur band	0	½	[a] 0	1	0	¼	0	½	0	½
Coal	1	1	0	6	0	9½	1	3	1	3½
Coal, shaly, broken	..	..	0	1	..	..	..	..	..	..
Shale (little sulphur)	[a] 0	½	..	..	..	..	[a] 0	1	[a] 0	½
Coal	0	2½	..	..	..	..	0	3	0	3½
Shale	[a] 0	½	..	..	[a] 0	½	0	½	[b] 0	½
Coal	1	5½	1	4	1	10	1	5½	1	8½
Coal, bony	..	..	..	..	..	..	..	..	0	½
Coal	..	..	..	..	..	..	..	..	0	5½
Floor, shale.										
Thickness of bed	4	2	4	3	4	4¼	4	1½	5	2
Thickness of coal sampled	4	1	4	2	4	3¾	4	½	5	1¼

[a] Not included in sample.

[b] One-half included in sample.

Sample 9428 was taken on the old fifth water-level gangway west, at the entrance to room 48.

Sample 9429 was taken on the old sixth water-level gangway, between rooms 6 and 7, east of new slope 3.

Sample 9432 was taken from the first level west, about 150 feet from the gangway up room 3 of the fourth battery.

Sample 9431 was taken from the face of room 12 of the third battery, on the first level west, 100 feet from the gangway. An additional 5½ inches of coal occurs at the bottom of the bed in this part of the mine.

Sample 9430 was collected on the east side of manway between the foot of the shaft and the third level, 150 feet up slope from the base of the shaft.

A composite sample was made by mixing the face samples 9428, 9429, 9430, 9431, and 9432 for an ultimate analysis, the results of which are shown under laboratory No. 9463 (p. 214).

Notes.—The partings that separated freely from the coal in the mine and the rock that fell from the roof were thrown in the gob when the cars were loaded. The coal was not picked at the bunkers because it was clean enough for locomotive use.

For chemical analyses of this coal see part I of this bulletin, pp. 213, 214.

ROSLYN. BUSY BEE MINE.

Sample.—Bituminous coal; analysis No. 9406 (p. 214).

Mine.—Busy Bee; an open cutting, 2½ miles west of Roslyn.

Coal bed.—Roslyn. The coal bed lies 6 feet below surface at the place where the sample was taken.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Busy Bee mine, 2½ miles west of Roslyn.

Laboratory No	9406	
	Ft.	*in.*
Roof, shale.		
Coal, weathered [a]	0	7
Coal	0	9½
Coal, soft, with layers of shale [a]	0	1
Coal	1	3
Shale [a]	0	1
Coal	0	3½
Shale [a]	0	½
Coal	0	9½
Coal [a]	0	7
Floor, shale.		
Thickness of bed	4	6
Thickness of coal sampled	3	1½

[a] Not included in sample.

Notes.—The lower 7 inches of the bed was not exposed. The coal is like the Roslyn coal at other mines in the vicinity. The high heating value and low ash content probably result in part from the whole thickness of the bed not being sampled. The coal was passed over bar screens. The oversize was picked and sold as lump coal. The undersize was sold as steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 214.

LEWIS COUNTY.[a]

CENTRALIA. RICHMOND MINE.

Sample.—Subbituminous coal; analysis No. 9177 (p. 214).

Mine.—Richmond; a slope mine in the SW. ¼ SW. ¼ sec. 34, T. 14 S., R. 2 W., 1½ miles northeast of Centralia.

Coal bed.—Potlatch.

The bed was measured and sampled in 1909 by E. E. Smith, as described on the following page.

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[a] For more detailed descriptions of Lewis County coals see U. S. Geol. Survey Bull. 374, pp. 152-167. The coals are of Tertiary age and have been included in the Puget formation.

Section of coal bed in Richmond mine, 1½ miles northeast of Centralia.

Laboratory No.	9177	
	Ft.	*in.*
Coal [a]	1	0
Shale, bony [a]	0	6
Coal (used as roof) [a]	0	8½
Coal	7	8½
Coal and shale, carbonaceous [a]	0	6
Coal [a]	1	0
Thickness of bed	11	5
Thickness of coal sampled	7	8½

[a] Not included in sample.

The sample was taken at the face of the north gangway and just beyond No. 10 chute on the first level, 600 feet from the mine entrance.

Notes.—The coal weathers readily on exposure to the air. It is massive and breaks with a conchoidal fracture. The coal was passed over ¾-inch screens and then picked. Only the large coal was placed on the market.

For chemical analyses of this coal see part I of this bulletin, p. 221.

Chehalis. Superior No. 1 Mine.

Sample.—Subbituminous coal; analysis No. 9942 (p. 214).

Mine.—Superior No. 1; a water-level mine located 1 mile northeast of Chehalis.

Coal bed.—This coal bed is about 11 feet in thickness. It dips 40° S. It is the same bed as mined at the Twin City mine about ¼ mile to the west. The entire bench of coal is mined, but inasmuch as the sample from the Twin City mine was taken from the lower bench a sample from the upper bench only in this mine was taken.

The bed was measured and sampled by E. E. Smith on February 15, 1910, as described below:

Section of coal bed in Superior No. 1 mine, 1 mile northeast of Chehalis.

Laboratory No.	9942	
Roof, sandstone.	*Ft.*	*in.*
Coal	1	7
Shale, sandy [a]	0	½
Coal	0	3
Shale, sandy [a]	0	½
Coal	2	0
Shale [a]	0	1
Coal	0	6
Floor, bony shale.		
Thickness of bed	4	6
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken 10 feet to the east of the entrance of the tunnel.

Notes.—The coal is brownish black and slacks readily upon exposure to the air. It is probably on the border line between low-grade subbituminous coal and high-grade lignite. The coal was passed over 1-inch bar screens at the bunker, and was then picked before being dumped into bin.

For chemical analyses of this coal see part I of this bulletin, p. 214.

Chehalis. Superior No. 2 Mine.

Sample.—Subbituminous coal; analysis No. 9941 (p. 214).

Mine.—Superior No. 2; a slope mine ¼ mile north of the depot at Chehalis on the main line of the Northern Pacific Railway.

Coal bed.—The coal bed is nearly 10 feet in thickness and dips 54° S. It was measured and sampled in 1910 by E. E. Smith, as described on the following page.

Section of coal bed in Superior No. 2 mine at Chehalis.

Laboratory No	9941	
Roof, soft sandstone.	*Ft.*	*in.*
Coal	3	11
Coal	4	6
Coal, slightly bony and soft	0	5½
Shale, carbonaceous, soft [a]	0	1
Coal	0	9
Coal, bony [a]	0	2
Floor, sandstone.		
Thickness of bed	9	10½
Thickness of coal sampled	9	7½

[a] Not included in sample.

The sample was obtained in chute 5, about 50 feet above the first level gangway.

Notes.—The coal slacks readily upon exposure to the air and is probably on the border line between low-grade subbituminous coal and high-grade lignite. The coal was passed over 1-inch bar screens at the bunkers and then picked.

For chemical analyses of this coal, see part I of this bulletin, p. 214.

CHEHALIS. TWIN CITY MINE.

Sample.—Subbituminous coal; analysis No. 9945 (p. 215).

Mine.—Twin City; a slope mine, 1 mile northeast of Chehalis.

Coal bed.—The coal bed worked is the lower part of the bed worked at the Superior No. 1 mine, about ¼ mile to the east. (See p. 556 of this report.) It dips 40° S.

The bed was measured and sampled on February 15, 1910, by E. E. Smith, as described below:

Section of coal bed in Twin City mine, 1 mile northwest of Chehalis.

Laboratory No	9945	
Roof, shale.	*Ft.*	*in.*
Coal, with thin irregular bands of shale [a]	4	0
Shale [a]	0	6
Coal	1	7
Shale [a]	0	3½
Coal	2	6
Shale [a]	0	1
Coal	0	7
Shale, thin lens	0	½
Coal	0	3½
Shale [a]	0	½
Coal	0	9½
Floor, shale.		
Thickness of bed	10	8½
Thickness of coal sampled	5	9½

[a] Not included in sample.

The sample was taken at the east end of the first level gangway, about 300 feet from the slope.

Notes.—The coal slacks readily upon exposure to the air. It is probably on the border line between low-grade subbituminous coal and high-grade lignite. The coal mined was passed over bar screens and picked.

For chemical analyses of this coal, see part I of this bulletin, p. 215.

CHEHALIS. CHEHALIS MINE.

Sample.—Subbituminous coal; analysis No. 9944 (p. 215).

Mine.—Chehalis; a drift mine, located 3 miles east of Chehalis.

Coal bed.—The coal bed dips 30° E.

The bed was measured and sampled on February 15, 1910, by E. E. Smith, as described on the following page.

Section of coal bed in Chehalis mine, 3 miles east of Chehalis.

Laboratory No	9944	
	Ft.	*in.*
Roof, shale.		
Coal	2	10
Shale, soft "mining"[a]	0	9½
Coal	2	9½
Floor, shale.		
Thickness of bed	6	5
Thickness of coal sampled	5	7½

[a] Not included in sample.

The sample was obtained from the first water-level gangway, 250 feet from the entrance of the mine, from a stump pillar which had been exposed in the mine air for some time. The coal slacks readily upon exposure to the air and probably is on the border line between low-grade subbituminous coal and high-grade lignite. The coal was screened and picked at the bunkers.

For chemical analyses of this coal, see part I of this bulletin, p. 215.

CHEHALIS. SHELDON MINE.

Sample.—Subbituminous coal; analysis No. 9943 (p. 215).

Mine.—Sheldon; a slope mine, 4 miles east of Chehalis, on logging road.

Coal bed.—The coal bed worked at this place is about 6 feet in thickness.

The bed was measured and sampled on February 15, 1910 by E. E. Smith, as described below:

Section of coal bed in Sheldon mine, 4 miles east of Chehalis.

Laboratory No	9943	
	Ft.	*in.*
Coal[a]	2+	0
Coal	2	0
Shale, carbonaceous[a]	0	2½
Coal[a]	0	6
Shale, carbonaceous[a]	0	2
Coal	3	5½
Floor, shale.		
Thickness of bed	8+	4
Thickness of coal sampled	5	5½

[a] Not included in sample.

The sample was taken 250 feet east of the slope and 40 feet up the pitch from the first level.

Notes.—The coal slacks readily upon exposure to the air. It was screened over 1-inch bar screens and then picked.

For chemical analyses of this coal, see part I of this bulletin, p. 215.

GLENAVON. PROSPECTS.

Sample.—Bituminous and anthracite coal; analyses Nos. 6488, 6490, 6496 (p. 215).

Location—Prospects; in T. 13 N., R. 4 E., near Glenavon.

Coal beds.—On account of the heavy forest covering, the exposures are very small, and the relation of the beds in each part of the field can not be definitely worked out from the surface. The beds in this area were measured and sampled by J. B. Umpleby in 1908, as described on the following page.

Section of coal bed in Luthkens prospect, 4½ miles southwest of Glenavon.

Laboratory No	6488	
	Ft.	in.
Coal, shaly [a]	1	1
Parting [a]	0	4½
Coal	0	11
Parting [a]	0	2
Coal	0	5
Parting [a]	0	1
Coal	1	7
Parting [a]	0	1½
Coal	1	1
Coal, slaty [a]	0	9
Clay, plastic.		
Thickness of bed	6	7
Thickness of coal sampled	4	0

[a] Not included in sample.

Section of coal bed in prospect, 5 miles west of Glenavon.

Laboratory No	6490	
Roof, clay.	Ft.	in.
Coal	1	6
Volcanic ash [a]	0	1
Coal	0	8½
Parting [a]	0	9½
Coal	1	0
Parting [a]	0	1
Coal	0	3½
Parting [a]	0	1
Coal	1	0
Parting [a]	0	1
Coal	1	6
Floor, shale.		
Thickness of bed	7	1½
Thickness of coal sampled	6	0

[a] Not included in sample.

Section of coal bed in Hofstetter prospect, 4½ miles southwest of Glenavon.

Laboratory No	6496	
Roof, clay.	Ft.	in.
Coal	1	1
Parting [a]	1	11
Coal	2	5
Parting [a]	1	0
Coal, bony [a]	0	2½
Floor, clay, shale, and coal.		
Thickness of bed	6	7½
Thickness of coal sampled	3	6

[a] Not included in sample.

Sample 6488 was collected from a 60-foot entry in the SE. ¼ sec. 14, T. 13 N., R. 4 E.

Sample 6490 was taken from an open cut, 10 feet deep, in the NE. ¼ sec. 10, T. 13 N., R. 4 E.

Sample 6496 was obtained from a 26-foot entry in the NW. ¼ sec. 14, T. 13 N., R. 4 E.

Notes.—The coal does not slack on exposure to the air. Sample No. 6496 was remarkably low in volatile matter, indicating either that the coal is anthracitic or was considerably coked. With this exception the samples indicate that the coals are impure bituminous coals.

For chemical analysis of this coal see part I of this bulletin, p. 215.

Ladd. East Creek Ladd Mine.

Sample.—Bituminous coal; analyses Nos. 6491, 6492, 6493, 6494, 9879, 9880, 9881, 9882 (p. 215).

Mine.—East Creek-Ladd; a tunnel and drift mine in sec. 13, T. 14 N., R. 4 E., at Ladd, on the Tacoma Eastern Railroad.

Coal beds.—Two coal beds, Nos. 2 and 3, were being developed at the time of sampling. Another bed above, called No. 4, was being prospected. The beds dip 40° W. No. 2 bed, the lowest, is the main commercial bed of the group. It was brought to the surface by a gangway and a rock tunnel. No. 3 bed lies 590 feet west of No. 2 bed and was being developed by a gangway that had been driven 250 feet. No. 4 bed is 160 feet west of No. 3 bed. A short gangway had been driven on it.

The beds were measured and sampled on January 27, 1910, by E. E. Smith (except samples 6491, 6492, 6493, 6494 which were taken by J. B. Umpleby, in 1908), as shown below:

Sections of No. 2 coal bed in East Creek-Ladd mine at Ladd.

Laboratory No.	9882		6493	
Roof: 9882, carbonaceous, soft shale; 6493, clay.	Ft.	in.	Ft.	in.
Coal	0	10	0	9½
Shale, clayey	[a] 0	1	[a] 0	1
Coal, "sulphur" in joints	1	9	..	..
Coal	..	..	1	11
Shale, carbonaceous	[a] 0	4	[a] 0	1
Coal	..	..	1	5
Coal, calcite veins	0	11	..	..
Floor: 6493, clay.				
Thickness of bed	3	11	4	3½
Thickness of coal sampled	3	6	4	1½

[a] Not included in sample.

Sections of No. 3 coal bed in East Creek-Ladd mine at Ladd.

Laboratory No.	6494		9881		9880	
	Ft.	in.	Ft.	in.	Ft.	in.
Coal	[a] 1	6	1	8	..	..
Parting	[a] 0	1	..	..	..	..
Shale and bony coal	..	..	[a] 0	6½	[a] 0	6½
Coal	[a] 0	8½	..	..	..	..
Bone	[a] 0	3½	..	..	..	..
Coal	4	1	..	..	..	..
Parting	[a] 0	11	..	..	..	..
Coal	[a] 1	8½	[a] 3	6½	3	6½
Floor, shale.						
Thickness of bed	9	3½	5	9	4	1
Thickness of coal sampled	4	1	1	8	3	6½

[a] Not included in sample.

Sections of No. 4 coal bed in East Creek-Ladd mine at Ladd.

Laboratory No.	9879		6492	
	Ft.	in.	Ft.	in.
Coal, bony, and shale	[a] 2	8½	[a] 16	6
Coal	1	8	1	11
Bone	..	..	[a] 0	2½
Shale	[a] 0	1	..	..
Coal	1	0	2	3½
Shale	[a] 0	3	..	..
Coal, bony	[a] 0	2½	..	..
Shale	[a] 0	½	..	..
Coal	1	0	..	..
Shale	0	½	..	..
Coal	0	5	..	..
Shale.				
Floor, shale, and bony coal.				
Thickness of bed	7	5	20	11
Thickness of coal sampled	4	1½	4	2½

[a] Not included in sample.

Sample 9882 was taken on the No. 2 bed, 60 feet up chute No. 62, from the first water-level gangway.

Two samples were taken at the face of the gangway on No. 3 bed—one (No. 9881) from the upper bench, and the other (No. 9880) from the lower bench, 250 feet from the opening. These benches are separated by 6½ inches of shale and bony coal which is removed from the coal by picking.

Sample 9879 was obtained from the face of the gangway on bed No. 4.

Sample 6493 was also taken from the No. 2 bed.

Sample 6494 was taken from the No. 3 bed, ½ mile southwest of Ladd, open cut, Watkins prospect.

Sample 6492 was taken from the short drift of the Watkins prospect, ½ mile southwest of Ladd, on No. 4 bed, where sample 9879 was taken.

Sample 6491 consisted of two samples of about 300 pounds each of washed coal from the No. 2 bed in the Ladd mine in section 12. It was taken at the bunker as it came from the washer. Each sample was reduced and quartered in the usual manner until 100 pounds was obtained. The two samples were then mixed, ground, and quartered until the final sample was reduced to about 4 pounds.

Notes.—The coal from No. 2 bed is a coking coal and produces fairly good coke. The coal is jointed, and in the lower part of the bed these joints are filled with calcite and some pyrite. The coal from No. 3 bed is heavier than the coal from No. 2 bed. Both benches of this bed contain coal of similar quality. It was considered fairly good coal for railroad and domestic purposes. The coal from all three beds does not slack during transportation to market, and may be classed as bituminous. The coal from No. 2 bed was picked at the bunkers and washed through a tub washer. The coal from No. 3 bed was picked at the entrance of the gangway and then flumed to the washer, which was situated at the entrance to the No. 2 bed. It was here mixed with the coal from the No. 2 bed and passed through the washer.

For chemical analyses of this coal see part I of this bulletin, p. 215.

LADD. NISQUALLY PROSPECT MINE.

Sample.—Bituminous coal; analysis No. 6489 (p. 215).

Mine.—Nisqually prospect; 2½ miles southwest of Ladd, in sec. 26, T. 14 N., R. 4 E.

Coal bed.—Not known, possibly No. 3 Ladd.

The bed was measured and sampled, in 1908, by J. B. Umpleby, as shown below:

Section of coal bed in Nisqually prospect mine, 2½ miles southwest of Ladd.

Laboratory No.	6489	
	Ft.	*in.*
Coal, very bony[a]	1	4
Clay, sandy[a]	0	5
Coal, very bony[a]	0	11
Clay[a]	0	½
Coal and bone in alternating bands[a]	0	10
Clay[a]	0	½
Coal, bony, dull layers	0	4½
Clay[a]	0	4½
Coal, hard, dull layers	0	8
Clay[a]	0	1
Coal, bony	0	8
Thickness of bed	5	9
Thickness of coal sampled	1	8½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 215.

LADD. SNOW PROSPECT.

Sample.—Bituminous coal; analysis No. 6495 (p. 215).

Location.—Snow prospect; open cut in the SE. ¼ sec. 34, T. 14 N., R. 4 E., 5½ miles southwest of Ladd.

The bed was sampled and measured in 1908 by J. B. Umpleby, as described below:

Section of coal bed in Snow prospect, 5½ miles southwest of Ladd.

Laboratory No.	6495	
	Ft.	*in.*
Coal	3	6
Parting[a]	0	5½
Coal	1	7
Parting[a]	0	3
Coal	0	8
Thickness of bed	6	5½
Thickness of coal sampled	5	9

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 215; also U. S. Geol. Survey Bull. 474, p. 64.

Littell. Crescent Mine.

Sample.—Subbituminous coal; analysis No. 9940 (p. 215).

Mine.—Crescent; a water-level mine located on a logging road 4 miles northwest of Littell.

Coal bed.—The bed dips 40° S. A bench of 1 foot 6 inches of coal is left as a roof. Wherever this roof is broken and the overlying sand is moist, the sand flows into the mine, making operating unsafe.

The bed was measured and sampled on February 16, 1910, by E. E. Smith, as described below:

Section of coal bed in Crescent mine, 4 miles northwest of Littell.

Laboratory No.	9940	
	Ft.	in.
Roof, sand.		
Coal [a]	1	6
Coal	0	9½
Shale, bony [a]	0	4
Coal	1	6
Shale	0	1
Coal	0	3½
Shale, bony [a]	0	6
Shale, yellow [a]	1	0
Shale, carbonaceous, bony [a]	0	9½
Coal	1	5
Shale [a]	0	½
Coal	1	3½
Floor, carbonaceous shale.		
Thickness of bed	9	6½
Thickness of coal sampled	5	4½

[a] Not included in sample.

The sample was taken at chute No. 18 between chutes Nos. 17 and 19, at a distance of about 800 feet from the entrance to the first water-level gangway.

Notes.—The mine was not being operated at the time it was visited. The coal slacks readily on exposure to the air.

For chemical analyses of this coal see part I of this bulletin, p. 215.

Longmire Springs. Weikel Prospect.

Sample.—Subbituminous coal; analysis No. 9091 (p. 216).

Location.—Weikel prospect; on the hillside south of Carlton Creek and abou 1,100 feet above the bed of the creek, in the SE. ¼ sec. 1, T. 14 N., R. 10 E., 12 miles east of Longmire Springs.

Coal bed.—No. 6. A gangway 90 feet in length had been driven on this bed. The bed has a strike due north and a dip of 60° W.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Weikel prospect, 12 miles east of Longmire Springs.

Laboratory No.	9091	
	Ft.	in.
Roof, shale.		
Shale, black [a]	3	2½
Coal, partly graphitic [a]	0	7
Shale, black, carbonaceous [a]	1	0
Coal	3	6
Coal, impure [a]	1	6
Floor, sandstone.		
Thickness of bed	9	9½
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken at the end of the gangway, 90 feet in.

Notes.—The coal is very hard and bright but contains a few thin stringers of dull coal. It burns with a short blue flame on a forge, and has the appearance of anthracite coal.

For chemical analyses of this coal see part I of this bulletin, p. 216.

LONGMIRE SPRINGS. SURFACE PROSPECT.

Sample.—Semianthracite coal; analysis No. 9092 (p. 216).

Location.—Prospect; on Summit Creek in the SE. ¼ NW. ¼ sec. 13, T. 14 N., R. 10 E., 12 miles east of Longmire Springs, and about 350 feet west of an opening on the Primrose bed.

Coal bed.—No. 4. The bed outcrops near the level of the creek, and only the center portion of it was exposed in the prospect. The bed belongs to the same group as the Primrose bed. It is slightly overturned and has a dip and strike practically the same as that of the Primrose.

The bed was measured and sampled in 1909 by E. E. Smith, the sample being taken from a 1-foot cut of coal which was overlain and underlain with 1 foot of bony coal.

For chemical analyses of this coal see part I of this bulletin, p. 216.

LONGMIRE SPRINGS. DAVIS PROSPECT.

Sample.—Subbituminous to anthracite coal; analyses Nos. 9097, 9099, 9100, 9101, 9102 (p. 216).

Location.—Davis prospect; on Summit Creek in the SE. ¼ NW. ¼ sec. 13, T. 14 N., R. 10 E., 12 miles east of Longmire Springs.

Coal bed.—This coal bed is known as the No. 6 or Primrose bed. It is about 20 feet in thickness. A gangway about 50 feet long had been driven in the lower part of the bed. The bed is slightly overturned, having a dip of 98°.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Davis prospect, 12 miles east of Longmire Springs.

	Ft.	*in.*
Roof, shale.		
(1) Coal, with thin layers of bone (9101)	2	8½
(2) Coal, bony, with some graphitic shale	2	6
(3) Shale, graphitic (9097)	1	5
(4) Shale, black	0	8½
(5) Coal and layers of bony coal (9102)	2	1
(6) Coal (9099 and 9100)	4	11
(7) Coal and graphitic shale in alternating layers	3	11
Floor, black shale.		
Thickness of bed	18	3

The laboratory numbers of the samples taken from the different portions of the bed are given in the section with the portions included in the samples. The section was measured and the samples taken from the face of an open cut across the bed at the entrance to the gangway.

The No. 1 bench, from which sample 9101 was taken, contains a large percentage of hard bright coal resembling that from No. 6 bench, but there are numerous thin layers of bony coal scattered throughout the bed which can be separated from the bed only with extreme difficulty. No sample was taken of No. 2 bench, but the coal resembles that in No. 5 bench which was sampled.

Sample 9097 was taken from the graphitic shale bench No. 3. The analysis of the sample shows that this bench is too high in ash to be of economic value.

Sample 9102 taken from No. 5 bench contains a high percentage of ash.

Sample 9099 was taken from bench No. 6 and represents the best bench in the bed.

Sample 9100 was collected from a 6-inch layer of the best coal near the center of No. 6 bench. This sample should represent the best picked coal from the bed.

Notes.—The analysis of sample 9100 compares favorably with the analyses of some of the anthracite coals of Pennsylvania. The percentage of volatile matter is somewhat higher than in the average Pennsylvania anthracite, but it is also lower than that of the semianthracite of Sullivan County, Pennsylvania.

For chemical analyses of this coal see part I of this bulletin, p. 216.

LONGMIRE SPRINGS. SUMMIT CREEK PROSPECT.

Sample.—Subbituminous coal; analysis No. 9098 (p. 216).

Location.—Summit Creek prospect; on Summit Creek in the SE. ¼ NW. ¼ sec. 13, T. 14 N., R. 10 E., 12 miles east of Longmire Springs.

Coal bed.—The bed is slightly overturned at this place and has the same dip and strike as the Primrose bed. It is separated from the Primrose by 25 feet of shale. A gangway had been driven on this bed a distance of 35 feet.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Summit Creek prospect, 12 miles east of Longmire Springs.

Laboratory No.	9098	
	Ft.	*in.*
Roof, shale.		
Coal	2	9½
Coal, poor [a]	0	7
Shale, black [a]	3	0
Coal, bony [a]	2	2½
Floor, shale.		
Thickness of bed	8	7
Thickness of coal sampled	2	9½

[a] Not included in sample.

The sample was taken from the face of the gangway. The coal was more or less crushed and mixed with carbonaceous shale.

For chemical analyses of this coal see part I of this bulletin, p. 216.

MENDOTA. MENDOTA MINE.

Sample.—Subbituminous coal; analyses Nos. 10323, 10324 (p. 216).

Mine.—Mendota; a slope mine in sec. 3, T. 14 N., R. 1 W., at Mendota, about 6 miles east of Centralia, on the Centralia & Eastern Railroad.

Coal bed.—Several coal beds were exposed in the property of the company, but only the one upon which the mine was working was sampled. The bed dips 12° W.

The bed was measured and sampled on September 30, 1909, by E. E. Smith, at two points, as described below:

Sections of coal bed in Mendota mine at Mendota.

Laboratory No.	10324		10323	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	2½	1	4
Shale, sandy	[a] 0	2½	[a] 0	½
Coal	1	1	0	6½
Shale, sandy	[a] 0	½	[a] 0	½
Coal	2	0	3	6
Shale, yellow-brown	[a] 0	1	[a] 0	1
Coal	0	2½	0	3
Shale	[a] 0	½	[a] 0	½
Coal, little stringers of bone	0	9½	..	..
Shale, yellow-brown	[a] 0	½	..	..
Coal	3	0	4	2½
Thickness of bed	9	8½	10	½
Thickness of coal sampled	9	3½	9	10½

[a] Not included in sample.

Sample 10324 was collected 80 feet above the gangway at the first level north, in room 2.

Sample 10323 was taken at the foot of the slope, 850 feet from the entrance of the mine. About one-half of each parting was included in the sample.

Notes.—The coal slacks readily upon exposure to the air. Irregular lenses of a soft cannel-like coal containing much volatile matter occur at intervals in this mine. It is black when first exposed but very soon turns to brown. Large pieces can be easily ignited in the hand with a match; they burn with a long, smoky flame.

Where the partings of the main bed were large and easily separated from the coal they were removed in the mine. The coal was picked and sized at the bunkers over a shaking screen with 2-inch perforations.

For chemical analyses of this coal see part I of this bulletin, p. 216.

SULPHUR SPRINGS. BARNETT SURFACE PROSPECT.

Sample.—Anthracite coal; analysis No. 9090 (p. 216).

Location.—Surface exposure; in the SE. ¼ sec. 7, T. 13 N., R. 10 E., about 2 miles east of Cowlitz River, and 6 miles east of Sulphur Springs.

Coal bed.—The coal bed outcrops near the summit of the hill and dips to the westward 32° and strikes N. 5° E. The bed has a total thickness of about 18 feet, only 3 feet of which was thought to be pure enough to be of any commercial value. The remainder of the bed was composed almost entirely of a hard black shale containing thin stringers of coal.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Barnett surface prospect, 6 miles east of Sulphur Springs.

Laboratory No.	9090	
	Ft.	*in.*
Roof, sandstone.		
Shale, bony [a]	3	0
Coal, bony, containing stringers of coal	3	0
Shale, bony, carbonaceous, with occasional very thin stringers of coal [a]	12	0
Thickness of bed	18	0
Thickness of coal sampled	3	0

[a] Not included in sample.

The sample was taken from the 3-foot bench of bony coal, after removing about 6 inches of coal from the face of the exposure.

Notes.—The small stringers of coal are very hard, jet black, and break with a conchoidal fracture.

For chemical analyses of this coal see part I of this bulletin, p. 216.

PIERCE COUNTY.[a]

ASHFORD. MASHEL MINE.

Sample.—Semibituminous coal; analyses Nos. 9884, 9885 (p. 217).

Mine.—Mashel; a drift mine in sec. 22, T. 15 N., R. 6 E., at Ashford, on the Tacoma Eastern Railroad.

Coal bed.—One coal bed was being worked in this mine. It was being developed at the end of a long rock tunnel which was driven to intercept the lower part of a bed which was known to outcrop along the crest of the ridge north of Ashford. The bed dips about 38° E., and is disturbed by faults.

The two benches of the bed were measured and sampled on January 26, 1909, by E. E. Smith, as described below:

Sections of coal bed in Mashel mine at Ashford.

Laboratory No.	9885		9884	
	Ft.	*in.*	*Ft.*	*in.*
Roof, broken shale.				
Coal	0	9½	..	..
Shale, black [b]	0	5	..	..
Coal	7	6	..	..
Coal, bony	0	2½	..	..
Coal	1	3½	..	..
Shale, slightly bony [b]	0	3	..	..
Coal, with few irregular layers of shale and bone	..	..	5	1
Floor, bone.				
Thickness of bed	10	5½	5	1
Thickness of coal sampled	9	9½	5	1

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[a] For more detailed descriptions of coals from Pierce County see U. S. Geol. Survey Bull. 374, pp. 167-193.

Not included in samples.

The samples were taken at the end of the gangway, about 4,400 feet from the entrance of the mine.

Sample 9885 was taken from the upper bench of the bed. The bed was overlain at this point by shale which was very badly crushed, several feet of which will break during mining and mix with the coal.

Sample 9884 was taken from the lower bench of the bed. Three inches of bony shale above this bench can be separated from the coal.

Note.—The coal is good bituminous coal and if a large percentage of the ash can be removed it should make good coke.

For chemical analyses of this coal see part I of this bulletin, p. 217.

For geologic relations see U. S. Geol. Survey Ann. Rept., pt. 3, pp. 399–436.

ASHFORD. LONGMIRE PROSPECT.

Sample.—Semibituminous coal; analysis No. 6486 (p. 217).

Location.—Longmire prospect; an open cut located in the SW. ¼ sec. 20, T. 15 N., R. 7 E., 7 miles east of Ashford.

Coal bed.—The coal bed is exposed in an open cut. It strikes N. 73° W. and dips 15° SW.

The bed was measured and sampled in 1908 by J. B. Umpleby, as described below:

Section of coal bed in Longmire prospect, 7 miles east of Ashford.

Laboratory No.	6486	
Roof, shale.	*Ft.*	*in.*
Coal	0	6
Parting [a]	0	2
Coal	0	8
Parting [a]	0	1
Coal	0	4
Parting [a]	0	10
Coal	1	9
Floor, slaty soft shale.		
Thickness of bed	4	4
Thickness of coal sampled	3	3

[a] Not included in sample.

Notes.—The ratio of volatile to fixed carbon of this coal is higher than in any other coal commercially developed in the State. The high ash content reduces the heating value.

For chemical analyses of this coal see part I of this bulletin, p. 217.

For geologic relations see U. S. Geol. Survey Ann. Rept., pt. 3, pp. 399–436.

BURNETT. BURNETT MINE.

Sample.—Bituminous coal; analyses Nos. 9886, 9887, 9888, 9889, 9890, 9891 (p. 217).

Mine.—Burnett; a slope mine in sec. 16, T. 19 N., R. 6 E., at Burnett, Pierce County, on the Northern Pacific Railway.

Coal beds.—Two coal beds were being worked in the mine—the No. 2, which is believed to be the same as the Wingate bed at Carbonado, and a bed which is believed to be the No. 3 of the old workings. The southern end of this bed is faulted and the relation of this bed to the other beds is not definitely known at present. The beds have a strike of about N. 20° W. and a dip of 45° E. The No. 2 bed varies somewhat in thickness throughout different parts of the mine. The No. 3 bed is about the same thickness, but the partings vary.

The beds were measured and sampled on January 19, 1910, by E. E. Smith, as described below:

Section of No. 2 coal bed in Burnett mine at Burnett.

Laboratory No.	9891	
Roof, carbonaceous shale.	*Ft.*	*in.*
Soft coal	2	2½
Shale, soft carbonaceous [a]	0	5½
Coal	1	6½
Floor, carbonaceous shale.		
Thickness of bed	4	2½
Thickness of coal sampled	3	9

[a] Not included in sample.

Sections of No. 3 coal bed in Burnett mine at Burnett.

Laboratory Nos	9890		9889		9888	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4	1	6	[a] 1	6
Shale	[a] 0	5½	[a] 0	5	[a] 0	5
Shale, carbonaceous	[a] 0	2	..	..	..	..
Coal	1	3	..	..	..	..
Coal, with irregular lenses of shale	..	..	[a] 5	7	5	7
Shale	[a] 0	8	..	..	..	..
Coal	0	½	..	..	..	..
Shale	[a] 0	4	..	..	..	..
Coal	0	½	..	..	..	..
Shale	[a] 0	½	..	..	..	..
Coal	0	4	..	..	..	..
Shale	[a] 0	1	..	..	..	..
Coal	1	3	..	..	..	..
Floor, shale.						
Thickness of bed	6	0	7	6	7	6
Thickness of coal sampled	4	3	1	6	5	7

[a] Not included in sample.

All of the samples taken from the mine were obtained from the second level.

Sample 9891 was taken from the No. 2 bed on the first crosscut, 2,200 feet south of the rock tunnel to the No. 3 bed. The bed is overlain with 5 inches of carbonaceous shale which breaks with the coal and must be removed at the bunkers.

Sample 9890 was taken on bed No. 3, 15 feet above the gangway, from the first manway to the south of the rock tunnel from No. 2 bed. The bed is overlain with about 6 inches of shale at this place. The shale mixed with the coal in mining and had to be removed at the bunkers.

Sample 9889 was taken from the north end of the gangway on bed No. 3, at a point 1,650 feet north of the rock tunnel, from the No. 2 bed. The sample was taken on the upper bench of coal, which, together with the 5 inches of shale underlying it, is in many places left as a roof for the lower bench. This bench is overlain with carbonaceous shale which is badly broken, makes a very poor roof. It mixed with the coal, and had to be removed at the bunkers.

Sample 9888 was taken from the place where sample 9889 was obtained, but from the lower bench. The bed contains irregular lenses of shale, most of which can be removed by careful picking and washing, and only a few of the thinnest were included in the sample. The shale underlying the bed is fairly firm and does not mix with the coal to any great degree.

Sample 9887 was taken from the surface of the storage bins in the bunkers by selecting about 75 pounds of small lumps at random over the surface of the coal. The coal of this sample was crushed and quartered. The opposite quarters were discarded and the remaining coal mixed and ground to the size of a pea. It was then quartered and reduced in the usual way until the final sample of about 4 pounds was obtained.

Sample 9886 was taken from the surface of the bins and of one 50-ton railroad car. The sample consisted of washed coal direct from the washer, which was still wet. It was prepared for analysis in the same way as sample 9887, but was sealed in the can while still moist.

Notes.—The coal from the No. 2 bed does not slack when exposed to the sun, nor does that from No. 3 bed. Both of these coals were used in making gas and coke. No attempt was made to separate impurities from the coal in the mine. At the bunkers the coal was passed over a shaking screen having 1½-inch perforations. The oversize was picked on a link-belt picking table by six men. It was then repicked over 1½-inch bar screens before being dumped into the bins. The undersize was washed in a tub washer.

For chemical analyses of this coal see part I of this bulletin, p. 217.

For geologic relations see U. S. Geol. Survey Ann. Rept., pt. 3, pp. 399–436.

Carbonado. Carbon Hill Mines.

Sample.—Bituminous coal; analyses Nos. 552-D, 2459, 2460, 9555, 9556, 9557, 9558, 9560, 9562, 9564, 9565, 9569, 9570, 9572, 9601 (pp. 217, 218).

Mine.—Carbon Hill; a series of drift and slope mines in sec. 4, T. 18 N., R. 6 E., at Carbonado, on the Northern Pacific Railway.

Coal beds.—More than a dozen coal beds have been worked at different times at this mine. At the time of sampling, 10 coal beds were being worked, 9 of which were sampled. The Carbon River cuts diagonally across the beds approximately along the line of a large fault which separates the more regular southern part of the formation from the folded part to the north. The beds on the south side of the river have a fairly uniform strike and dip, the strike being nearly north and south, and the dip decreasing from 60° near the north end to about 20° at the south end. North of the river the beds are somewhat closely folded and in many places broken by small faults. The beds were numbered in an order that have no reference to their position in the series. Three slopes had been driven—one on the Wingate bed, on the southwest side of the river, and known as the No. 1 slope; another on the Wingate bed on the north side of the river and known as the No. 6 slope; and another on the No. 1 bed at the end of a long rock tunnel which is known as Mine No. 1 North. The last-mentioned slope is spoken of as the Electric Slope. The remaining openings are all only slightly above the river and are spoken of as water levels. The beds and the partings in the beds are fairly continuous throughout the workings. About ½ mile south of the No. 1 slope on the Wingate the bed is offset by a diagonal dike. To the south of the dike the bed has a different section than to the north, as shown by the sections given below of the Wingate bed.

The beds were measured and sampled on December 6 and 7, 1909, by E. E. Smith (except sample 552-D which was taken by K. M. Way in 1908, and samples 2459 and 2460 which were taken by M. R. Campbell on October 17, 1905), as shown below:

Section of No. 1 coal bed in Carbon Hill mine at Carbonado.

Laboratory No	9572		2460	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	9½	[a]1	0
Shale and broken coal	[a]0	2½	[a]0	½
Coal	0	11½	1	9
Shale	[a]0	½	[a]0	7
Coal	0	5	1	8
Shale	[a]0	2½	[a]0	¾
Coal	0	3	0	8
Shale, hard	[a]0	½	[a]0	1
Coal	2	0	1	2
Coal, bony	[a]0	5	..	..
Floor, shale.				
Thickness of bed	7	4	7	½
Thickness of coal sampled	6	5	5	3

[a] Not included in sample.

Section of coking coal bed No. 1 in Carbon Hill mine at Carbonado.

Laboratory No	9569	
Roof, shale.	*Ft.*	*in.*
Coal, impure	0	3
Coal, finely jointed and crushed	1	3½
Shale, irregular [a]	0	1
Coal, finely jointed and crushed	0	9½
Floor, black shale.		
Thickness of bed	2	5
Thickness of coal sampled	2	4

[a] Not included in sample.

Section of coking coal bed No. 2 in Carbon Hill mine at Carbonado.

Laboratory No	9557	
	Ft.	*in.*
Roof, shale.		
Coal	2	7
Shale, hard [a]	0	½
Coal	1	6
Shale [a]	0	1
Coal	0	3
Coal, fine-grained metallic	0	2½
Coal	0	2½
Shale, hard [a]	0	1
Coal, bright, minutely jointed	0	11½
Shale	0	¼
Coal, bright, minutely jointed	0	6½
Shale [a]	0	1
Coal	2	2½
Floor, shale.		
Thickness of bed	8	9¼
Thickness of coal sampled	8	5¾

[a] Not included in sample.

Section of coking coal bed No. 3 in Carbon Hill mine at Carbonado.

Laboratory No	552–D	
	Ft.	*in.*
Coal	1	10
Shale [a]	0	4
Coal	1	10
Shale [a]	0	1¼
Coal	0	10
Shale [a]	0	1
Coal	0	7
Shale [a]	0	2
Coal	2	4
Thickness of bed	8	1¼
Thickness of coal sampled	7	5

[a] Not included in sample.

Section of upper bench of coking coal bed No. 3 in Carbon Hill mine at Carbonado.

Laboratory No	9565	
	Ft.	*in.*
Roof, hard shale.		
Coal	1	5
Shale [a]	1	0
Coal [a]	2	0
Shale [a]	0	2½
Coal [a]	3	5
Coal, bony [a]	0	7
Floor, shale.		
Thickness of bed	8	7½
Thickness of coal sampled	1	5

[a] Not included in sample.

Section of lower bench of coking coal bed No. 3 in Carbon Hill mine at Carbonado.

Laboratory No	9555	
	Ft.	*in.*
Roof, hard shale.		
Coal [a]	1	5
Shale [a]	1	0
Coal	2	0
Shale [a]	0	2½
Coal	3	5
Coal, bony	0	7
Floor, shale.		
Thickness of bed	8	7½
Thickness of coal sampled	6	0

[a] Not included in sample.

Section of coal bed No. 4 in Carbon Hill mine at Carbonado.

Laboratory No	9562	
Roof, carbonaceous shale.	*Ft.*	*in.*
Coal	1	7
Shale [a]	0	½
Coal, impure	0	3
Shale [a]	0	½
Coal	1	5½
Shale, "sulphur" [a]	0	½
Coal	0	6
Shale, "sulphur" [a]	0	1
Coal	1	7
Coal, bony [a]	1	3½
Thickness of bed	6	10½
Thickness of coal sampled	5	4½

[a] Not included in sample.

Section of coal bed No. 5 in Carbon Hill mine at Carbonado.

Laboratory No	9564	
Roof, shale.	*Ft.*	*in.*
Coal	1	10
Shale, irregular [a]	0	2½
Coal, impure [a]	0	3½
Coal, crushed	2	2½
Floor, hard shale and some coal.		
Thickness of bed	4	5½
Thickness of coal sampled	4	½

[a] Not included in sample.

Section of coal bed No. 11 in Carbon Hill mine at Carbonado.

Laboratory No	9570	
Roof, black shale.	*Ft.*	*in.*
Coal	1	1
Shale [a]	0	3½
Coal	1	½
Shale [a]	0	2½
Shale. carbonaceous [a]	0	2½
Coal	1	0
Shale [a]	0	4
Coal [a]	0	3
Floor, shale.		
Thickness of bed	4	5
Thickness of coal sampled	3	1½

[a] Not included in sample.

Sections of Wingate coal bed in Carbon Hill mine at Carbonado.

Laboratory No	9601		9560		2459		9558	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Shale, carbonaceous, thin streaks of coal [a]	0	10	..	..	..	..	..	..
Coal	4	1	4	6	4	11	5	1
Floor, hard shale.								
Thickness of bed	4	11	4	6	4	11	5	1
Thickness of coal sampled	4	1	4	6	4	11	5	1

[a] Not included in sample.

Sample 9570 was taken 500 feet from the entrance to the gangway on No. 11 bed and about 40 feet above the gangway in chute 10 or chute 11. The coal bed was disturbed at this place and considerably broken. Both the roof, the floor, and the coal and shale that separated the bed from the floor were badly broken. They mixed with the coal in mining and had to be removed in preparation for the market.

Sample 9556 included a 3-foot 7-inch cut of coal from the No. 9 bed, underlain with shale, was taken from the south end of the gangway, about 400 feet from the entrance of the water level on bed No. 9. The bed is overlain with black shale, which is fairly firm and did not mix with the coal.

Sample 9564 was taken at the south end of the water-level gangway of bed No. 5, about 3,200 feet from the entrance. The roof and floor do not mix with the coal in mining.

Sample 9572 was taken from the first level on the No. 1 (83-inch) bed about 100 feet up chute No. 13, and 600 feet north of the bottom of the electric slope. The bed contains several partings which can be separated in preparation for the market and were not included in the sample. The roof and floor are fairly firm, but in places they broke and mixed with the coal somewhat.

Sample 9562 was taken from the No. 4 bed about 200 feet up chute No. 14 north of the entrance to the gangway. Pieces of the roof and the floor mixed only slightly with the coal and could be removed at the bunkers.

Sample 9565 was taken at the south end of the gangway on the No. 3 coking bed at a point about 1,900 feet south and 100 feet west of the northeast corner of sec. 14, T. 18 N., R. 6 E. It was taken from the upper bench of the bed. This bench is overlain with bony shale, which makes a very poor roof. Pieces of it mixed with the coal in mining.

Sample 9555 was taken from the lower bench of the No. 3 coking bed at the same place from which sample 9565 was taken. The lower layer of the bench is somewhat bony, but was mined with the rest of the bench and was included in the sample. This bench is separated from the upper bench by about a foot of shale. The entire bed was mined as one bench and this shale parting was removed at the bunkers.

Sample 9557 was taken from the north end of the gangway on the No. 2 coking bed at a point about 3,200 feet south and 100 feet west of the northeast corner of section 14. Both the roof and the floor of the bed are of shale and were badly broken. They mixed with the coal mined and were separated at the bunkers.

Sample 9569 was taken from the No. 1 coking bed at the end of the rock tunnel from the No. 2 coking bed. This bed is believed to be one of the beds worked at the Wilkeson mine and is very much thinner at this place, probably on account of local movement along the bed. The upper part of the coal is somewhat impure, but was included in the sample. The coal in the two benches was finely jointed and crushed, indicating considerable movement. The floor shale became mixed with the coal in mining.

Sample 9560 was composed of two samples taken from the Wingate bed near the No. 1 slope. One-half of the sample was taken at the south end of the third level gangway about 40 feet south of the main slope. The other half of the sample was taken from the same water level at the end of the gangway 280 feet north of the slope. Both the roof and the floor of the bed are hard and firm and do not mix with the coal.

Sample 9558 was taken from the third level in No. 6 mine on the Wingate bed about 20 feet north of the slope in the first crosscut. Both the roof and the floor are firm and do not become mixed with the coal except in places.

Sample 9601 was taken from the No. 1 slope on the Wingate bed in the tenth crosscut between chutes 56 and 57 of the second level. The upper part of the coal bed in this part of the mine is replaced with carbonaceous shale containing thin streaks of coal. This broke with the coal and had to be separated at the bunkers.

Sample 2460 was taken from the No. 1 bed on the east dip at chute 11, halfway between the synclinal point and the anticlinal end, 3,000 feet from tipple at Carbon River.

Sample 2459 was taken from the Wingate bed, 1,000 feet from the slope, on the level 700 feet below the river near a small fault.

Sample 552-D was taken from the No. 3 coking bed in the third main entry of the north workings. It was taken from the face of the gangway at a distance of about 1,400 feet from the entrance to the No. 1 north tunnel.

Notes.—The coal from this mine was prepared for the market by three processes. The dry coal from the Wingate bed was passed over 3-inch bar screens. The oversize was picked and sold as lump. The undersize was picked by hand and was sold as unwashed coal, or was flumed to the washer. The coal from No. 6 mine and the wet coal from the No. 1 mine of the Wingate bed were handled by the second process, being washed from the mine cars and passed over bar screens having 2¼-inch and 1¾-inch openings. The oversize was picked twice. The undersize was passed through two tub washers. The concentrates were carried by drags over draining screens having slits about 0.06 inch in width into the bunkers for the washed Wingate coal. The fine coal which passed through the slits was settled in a special tank. The fine coal was drawn from the bottom of the settling tank and carried by drags over a draining screen having slits about 0.03 inch wide. The coal which passed over the screen was called "birdseye"; that which passed through the screen was separated in large settling tanks and was called "coal dust." The coal dust and birdseye were sold in Seattle and Tacoma to be used in automatic stoker boilers for large heating plants. About 50 tons per day of coal dust and birdseye was saved out of a total output of 800 tons. The coal from the other beds, all of which was treated by the third method, was passed over bar screens having 2¼-inch and 1¾-inch spaces. The oversize was picked three times, and sold as lump. The undersize was passed through a washer and was treated in the same manner as the coal from the Wingate bed. Jig washers had been installed for cleaning the coal for coking, but were not in use at the time of sampling. None of the coals slacks when exposed to the sun. All compare favorably with many of the bituminous coals of the eastern part of the United States.

For analyses of these coal see part I this report, pp. 217, 218. Also for analysis of 552-D see Bureau of Mines Bull. 5, p. 5; for washing and coking tests see Bureau of Mines Bull. 5, pp. 32, 46.

For geologic relations see U. S. Geol. Survey Ann. Rept., pt. 3, pp. 399–436.

CARBONADO. CARBONADO NO. 4 N. MINE.

Sample.—Bituminous (?) coal; analyses Nos. 10573, 10574, 10575 (p. 219).

Mine.—Carbonado No. 4 N.; at Carbonado.

Coal bed.—No. 4 north or Wilkeson.

The bed was measured and sampled at two points, on June 8, 1910, by H. M. Wolflin, as shown below:

Sections of coal bed in Carbonado No. 4 N. mine at Carbonado.

Laboratory No.	10573		10574	
	Ft.	*in.*	*Ft.*	*in.*
Roof, black shale.				
Coal	1	¾	1	2¼
Black sandstone	[a]0	1	..	..
Black shale	..	..	[a]0	1
Light gray clay	[a]0	4	[a]0	4¾
Black carbonaceous shale	[a]0	1	[a]0	1
Dark gray clay	[a]0	1	[a]0	1
Coal	1	1	1	2½
Sandstone	[a]0	1¼	[a]0	1¼
Coal	1	7	0	8½
Black sandy shale	[a]0	½	0	½
Coal	0	10½	1	2½
Floor, shale.				
Thickness of bed	5	4	5	1¼
Thickness of coal sampled	4	7¼	4	4¼

[a] Not included in sample.

Both samples were taken from a rib in chute 16, 2 blocks below No. 14 counter. The samples were wet when taken.

A composite sample was made by mixing the rib samples 10573 and 10574 for an ultimate analysis, the results of which are shown under laboratory No. 10575.

For chemical analyses of this coal see part I of this bulletin, p. 219.

FAIRFAX. FAIRFAX MINE.

Sample.—Bituminous coal; analyses Nos. 9574, 9607, 9608, 9609 (p. 219).

Mine.—Fairfax; a drift and slope mine one-fourth mile south of Fairfax, Pierce County, on the Northern Pacific Railway.

Coal beds.—Three beds in the mine were measured and sampled. The lower bed, known as the Blacksmith bed, was not being worked at the time of sampling. The middle or No. 3 bed was being worked on the first level, and the upper or No. 7 bed was being worked on the water level. The beds strike N. 30° W. and dip about 75° NE. Bed No. 3 was the only one being worked to any considerable extent. Both the roof and floor of the bed are very firm, but they are not uniform. In some places the bed is only about a foot in thickness, and in other places it is nearly 4 feet.

The beds were measured and sampled on December 16 and 18, 1910, by E. E. Smith, as described below:

Section of No. 3 coal bed in Fairfax mine at Fairfax.

Laboratory No.	9607	
Roof, very hard shale.	*Ft.*	*in.*
Coal, slightly bony	0	3
Coal	0	6
Shale, hard [a]	0	1
Coal	2	11½
Coal, bony [a]	0	3
Floor, hard, flinty shale.		
Thickness of bed	4	½
Thickness of coal sampled	3	8½

Section of No. 7 coal bed in Fairfax mine at Fairfax.

Laboratory No.	9608	
Roof, shale (poor roof).	*Ft.*	*in.*
Coal, broken	5	3½
Shale, hard [a]	0	4
Coal	2	8½
Floor, shale (poor floor).		
Thickness of bed	8	4
Thickness of coal sampled	8	0

Section of Blacksmith bed in Fairfax mine at Fairfax.

Laboratory No.	9609	
Roof, shale.	*Ft.*	*in.*
Shale, carbonaceous [a]	0	2½
Coal	1	9
Floor, shale.		
Thickness of bed	1	11½
Thickness of coal sampled	1	9

[a] Not included in sample.

Sample 9607 was taken from bed No. 3, 80 feet below the north water level in chute 8. Both roof and floor are very hard and do not mix with the coal in mining.

Sample 9608 was taken from bed No. 7 at the end of the water-level gangway, about 75 feet south of the rock tunnel, from bed No. 3. Both roof and floor are very poor; pieces mixed with the coal and had to be removed at the bunkers.

Sample 9609 was taken from the Blacksmith bed at the south end of a short gangway, from a rock tunnel about 500 feet along the main gangway from slope No. 3. The bed varies in thickness, and the coal for the sample was taken in two places within a few feet of each other. Both roof and floor are hard and did not mix with the coal in mining except where local lenses of shale occur under the roof.

Sample 9574 was made up from about 75 pounds of washed coal from the bunkers, which had stood in them under cover for some time. Small quantities of coal, all in fragments less than three-fourths of an inch in diameter, were taken at irregular intervals from the surface of the coal. The coal was thoroughly mixed and quartered in the usual manner until about 20 pounds was left; this was ground to the size of a pea and quartered until the final sample of 4 pounds was obtained.

Notes.—At the bunkers the coal was passed over a shaking screen having 1½-inch perforations. The oversize was hand picked to remove the shale partings and other impurities, then passed through a crusher, and thence conveyed to the washer. The undersize was washed through a Jeffery-Robinson washer and rewashed through two jigs. Nearly the entire output was coked in the ovens at the mine. A small amount, however, was sold occasionally for blacksmithing coal. All the Fairfax coal does not slack when exposed to the air, but that from bed No. 7 contains a large amount of ash.

For chemical analyses of this coal see part I of this bulletin, p. 219.

FAIRFAX. MONTEZUMA MINE.

Sample.—Semibituminous coal; analyses Nos. 9602, 9603, 9604, 9605, 9606, 9613 (p. 219).

Mine.—Montezuma; a series of drifts located about 1 mile south of Fairfax, near the Northern Pacific Railway.

Coal beds.—Four coal beds were exposed in this mine which are as follows in descending order in the series: Nos. 1, 2, 3, and 4. No. 1 was not being worked at the time of sampling. The beds are all thin, and but for the steepness of the dip, 65° to 70°, would be very difficult to work. In a few places underneath some of the beds small lenses of coal occur which can be mined with the bed.

The beds were measured and sampled on December 17 and 18, 1909, by E. E. Smith, as described below:

Section of No. 1 coal bed in Montezuma mine, 1 mile north of Fairfax.

Laboratory No	9602	
	Ft.	*in.*
Roof, soft shale.		
Coal	0	9½
Shale, hard [a]	0	3½
Coal	3	2½
Floor, soft yellow clay and shale.		
Thickness of bed	4	3½
Thickness of coal sampled	4	0

Section of No. 2 coal bed in Montezuma mine, 1 mile north of Fairfax.

Laboratory No	9603	
	Ft.	*in.*
Roof, shale, with sandstone above.		
Coal	1	4
Shale [a]	0	1
Coal	1	1
Shale, carbonaceous, soft [a]	0	2½
Coal	0	2½
Floor, bony shale.		
Thickness of bed	2	11
Thickness of coal sampled	2	7½

[a] Not included in sample.

Section of No. 3 coal bed in Montezuma mine, 1 mile north of Fairfax.

Laboratory No	9605	
	Ft.	*in.*
Roof, flinty sandstone and hard shale.		
Coal, bright	1	6
Coal, broken	1	0
Coal, slightly bony	0	3½
Shale [a]	0	3½
Coal and bone [a]	1±	0
Floor, sandstone.		
Thickness of bed	4	1±
Thickness of coal sampled	2	9½

[a] Not included in sample.

Section of No. 4 coal bed in Montezuma mine, 1 mile north of Fairfax.

Laboratory No	9606	
	Ft.	*in.*
Shale, carbonaceous[a]	0	5
Coal, small "niggerhead" near center (local)	1	11
Coal, very slightly bony	0	8½
Shale[a]	1	0
Coal[a]	4	0
Thickness of bed	8	½
Thickness of coal sampled	2	7½

[a] Not included in sample.

Sample 9602 was taken from the No. 1 bed at the entrance to chute 4, on the north water level. Pieces of the shale roof and floor clay mixed with the coal in mining and had to be separated at the bunkers.

Sample 9603 was taken from the No. 2 bed, 5 feet above the first counter in chute 36. Pieces of the overlying bony coal and soft shale mixed with the coal and had to be separated at the bunkers.

Sample 9604 was made up of 165 pounds of coal from the No. 2 bed which was collected in small quantities at random from the surface of the bunker at the railroad track. It was thoroughly mixed, quartered, and reduced until a sample of about 25 pounds was obtained. This was ground to the size of a pea, mixed, quartered, and reduced until the final sample of about 4 pounds was obtained.

Sample 9605 was taken from the No. 3 bed, 5 feet above the gangway in chute 11. The bed at this point is separated by a parting of shale from a lower bench of coal and bone which was mined in part of the mine.

Sample 9606 was taken from No. 4 bed just above the second counter on chute 6. At this place the bed is underlain with a local pocket of coal about 4 feet thick, which is an enlargement in a layer whose normal thickness is about 6 inches.

Sample 9613 consisted of about 140 pounds of washed coal collected in small quantities at random from the surface of the bunker in which the No. 3 and the No. 4 coal was stored. It was prepared for the laboratory in the same manner as sample 9604 was prepared.

Notes.—The coal from the four beds produces a very small amount of lump. It does not weather when exposed to the sun. The coal from the No. 2 bed was considered to be a good coking coal and was also used to a large extent as blacksmith coal. The No. 3 bed was considered to be the best blacksmith coal in this mine. The coal from No. 3 and No. 4 beds was washed and stored separately from the coal from No. 2 bed. The coals from all the beds were passed over a shaking screen having 1½-inch perforations. The oversize was picked and used as domestic and steam coal. The undersize was washed through feldspar jig washers and flumed to a bunker at the railroad track, where most of it was used in the manufacture of coke. A small part of the washed coal was sold for blacksmith coal.

For chemical analyses of this coal see part I of this bulletin, p. 219.

MELMONT. MELMONT MINE.

Sample.—Bituminous to semianthracite coal; analyses Nos. 9576, 9577, 9578, 9579, 9580, 10412 (p. 220).

Mine.—Melmont, a slope and drift mine in T. 18 N., 6 E., at Melmont, Pierce County, on the Northern Pacific Railway.

Coal beds.—Three coal beds are exposed in the mine, and the lower two were being worked at the time the mine was visited. Bed No. 1 is the highest in the series and was not being worked. No. 2 is next lower and was being mined on a short water-level gangway. The No. 3 is the main bed of the mine and was being worked in the first level. The beds have a strike of N. 30° W. and a dip of 42° SW. The No. 3 bed is fairly uniform in thickness throughout the mine. The rocks of the entire region in which this mine is situated are very badly broken. The joints are close together and extend through both the roof and the floor so that the roof pressure is heavy in all parts of the workings.

The beds were measured and sampled in December, 1909, by E. E. Smith, as described below:

Section of coal bed No. 1 in Melmont mine at Melmont.

Laboratory No	9577	
	Ft.	in.
Roof, shale.		
Coal	0	7
Shale [a]	0	1
Coal	0	6½
Shale, bony [a]	1	5
Coal	1	11
Coal, soft, clayey [a]	0	1
Coal	0	6
Floor, shale, thin layers of bony coal.		
Thickness of bed	5	1½
Thickness of coal sampled	3	6½

[a] Not included in sample.

Section of No. 2 coal bed in Melmont mine at Melmont.

	Ft.	in.
Roof, shale (poor).		
Shale, carbonaceous, soft	0	4½
Coal [a]	3	6
Dirt, black	0	4
Coal [b]	5	3½
Shale	0	2½
Coal.		
Thickness of bed	9	8½

[a] Included in sample 9576. [b] Included in sample 9580.

Sections of No. 3 coal bed in Melmont mine at Melmont.

Laboratory No	9579		9578	
	Ft.	in.	Ft.	in.
Roof, shale (poor).				
Shale, carbonaceous, soft	..	..	[a]1	5
Coal, broken (lower 1 foot 3½ inches solid)	5	5	..	..
Coal	..	..	4	0
Shale	0	½	..	..
Coal	0	11½	[a]2	0
Floor, shale.				
Thickness of bed	6	5	7	5
Thickness of coal sampled	6	5	4	0

[a] Not included in sample.

Sample 9579 was taken from the No. 3 bed on the first level north, 50 feet above gangway in chute 73. Both the roof and the floor of the bed were badly jointed at this place and mixed to a considerable extent with the coal.

Sample 9578 was taken from bed No. 3 on the first level north, about 200 feet up the dip, in the pillar between chutes 56 and 57. The workings were subjected to a very heavy squeeze at this point and only part of the bed could be sampled. The 1½ feet of carbonaceous shale was badly broken and pieces of it mixed with the coal in the mining. The cap rock of shale was also badly broken and made a poor roof.

Sample 9576 was taken from the upper bench of No. 2 bed on the first water-level gangway north, 25 feet above the entrance to chute 2. The coal is overlain with an irregular layer of soft carbonaceous shale. Pieces of this and of the roof became mixed with the coal in mining and had to be separated at the bunkers.

Sample 9580 was taken from the same place in the mine from which sample 9576 was obtained. In mining, the 4 inches of black dirt between had to be separated at the bunkers. Pieces of the shale floor became mixed with the coal in mining.

Sample 9577 was taken from the north end of the first water-level gangway on bed No. 1, about 100 feet from the main rock tunnel. The roof is poor, and pieces of it became mixed with the coal in mining. A composite sample was made by mixing equal parts of samples 9576 and 9580 for an ultimate analysis, the results of which are shown under laboratory No. 10412 (p. 220).

Notes.—The No. 3 bed is badly broken by joints, so that it produces a small amount of lump coal. The coal does not weather on exposure to the air. All these coals coke and were used as blacksmith coal. No attempt was made to separate impurities from the coal in the mine. At the bunkers the coal was passed over shaking screens having perforations 2 inches in diameter. The oversize from these screens was picked on a link-belt picking table and conveyed to the bunkers. The undersize was sorted through a set of revolving screens, and the different sizes were washed through feldspar jigs.

For chemical analyses of this coal see part I of this bulletin, p. 220.

PITTSBURG. BLACK CARBON MINE.

Sample.—Bituminous (?) coal; analysis No. 9892 (p. 220).

Mine.—Black Carbon; a drift mine in sec. 22, T. 19 N., R. 6 E., on the Northern Pacific Railway, ½ mile west of Pittsburg.

Coal bed.—Black Carbon. The bed has a dip of 40° E.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Black Carbon mine, ½ mile west of Pittsburg.

Laboratory No.	9892	
Roof, shale.	*Ft.*	*in.*
Coal	0	11
Shale	0	¼
Coal	0	8½
Shale [a]	0	¼
Coal	0	5½
Shale (lens) [a]	0	½
Coal	1	3½
Shale [a]	0	½
Coal	0	5
Shale [a]	0	½
Coal (very good)	0	9½
Coal, bony [a]	0	7
Clay, yellow [a]	0	3
Floor, black shale.		
Thickness of bed	5	7
Thickness of coal sampled	4	7¼

[a] Not included in sample.

The sample was taken from chute 2½, about 6 feet above the gangway and 1,250 feet from the entrance to the mine.

Notes.—No attempt was made to separate any of the impurities from the coal in the mine. It was picked at the bunkers over bar screens having 1½-inch openings. The coal does not crumble when exposed to the sun.

For chemical analyses of this coal see part I of this bulletin, p. 220.

For geologic relations see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436.

PITTSBURG. PITTSBURG MINE.

Sample.—Bituminous coal; analyses Nos. 9894, 9895 (p. 220).

Mine.—Pittsburg; two slope mines located at Pittsburg, on the Northern Pacific Railway.

Coal beds.—Two coal beds are worked in this mine, the Lady Wellington and the Pittsburg. They have a strike of N. 15° W., and a dip of 58 to 60° W.

The beds were measured and sampled on January 18, 1910, by E. E. Smith, as described on the following page.

Section of Pittsburg coal bed in Pittsburg mine at Pittsburg.

Laboratory No	9894	
Roof, shale.	*Ft.*	*in.*
Coal (good)	0	10½
Bone	0	¼
Coal	1	2½
Shale and bone [a]	0	4
Coal	0	4
Shale lens [a]	0	1
Coal	0	6½
Shale [a]	0	1½
Coal	1	2½
Floor, bone.		
Thickness of bed	4	8¾
Thickness of coal sampled	4	2¼

[a] Not included in sample.

The sample was taken at the face of the gangway just beyond chute No. 13½, on the first level of the Pittsburg bed. Both the roof and floor of the bed are firm and do not mix with the coal.

Sample 9895 was taken from a 4-foot 11-inch cut of coal which was overlain and underlain with shale. It was taken from the first crosscut between chutes Nos. 32½ and 33 on the first level of the Lady Wellington bed. Both the roof and floor are firm and do not mix with the coal in mining.

Notes.—No attempt was made to separate the impurities from the coal in the mine. The coal from the Pittsburg bed was hoisted and dumped immediately on to 1½-inch bar screens. The oversize was hand picked and the undersize was conveyed by flume to the washer at the bunkers. The coal from the Lady Wellington bed was hauled directly to the bunkers, where the lump coal was picked by hand and the fine coal was washed through jigs.

For chemical analyses of this coal, see part I of this bulletin, p. 220.

For geologic relations, see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436.

South Willis. South Willis Mine.

Sample.—Bituminous coal; analysis No. 9906 (p. 220).

Mine.—Willis; a slope and water-level mine in sec. 22, T. 19 N., R. 6 E., at South Willis, on the Northern Pacific Railway, about 2 miles from Wilkeson.

Coal beds.—The coal beds worked in this mine parallel the beds worked at the Wilkeson and Gale Creek mines, but are higher in the series. They have a strike of about N. 10° W. and a dip of about 56° to the east. Two beds, the No. 1 bed and the Windsor bed, were being worked at the time of sampling, but the higher (No. 1) bed was not normal and was not sampled.

The Windsor bed was measured and sampled in December, 1909, by E. E. Smith, as described below:

Section of Windsor coal bed in South Willis mine at South Willis.

Laboratory No	9906	
Roof, shale.	*Ft.*	*in.*
Shale, carbonaceous [a]	0	3
Coal	4	4
Coal, soft, impure [a]	0	2½
Floor, shale.		
Thickness of bed	4	9½
Thickness of coal sampled	4	4

[a] Not included in sample.

The sample was taken from a point 25 feet beyond chute 11, on the lower water-level gangway. The bed is overlain with carbonaceous shale and underlain by soft impure coal, both of which mix more or less with the coal and must be separated at the bunkers.

Notes.—The coal from the Windsor bed and from the No. 1 bed was passed over 1½-inch bar screens at the bunkers. The oversize was picked and used solely as lump coal. The undersize was washed in a tub washer.

For chemical analyses of this coal, see part I of this bulletin, p. 221.

For geologic relations, see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436

WILKESON. BRIER HILL MINE.

Sample.—Bituminous coal; analysis No. 9897 (p. 221).

Mine.—Brier Hill; a water-level mine in sec. 28, T. 19 N., R. 6 E., one-fourth mile west of Wilkeson, on the Northern Pacific Railway.

Coal bed.—The coal bed upon which this mine was worked belongs to the group which occurs at the Gale Creek mine, but it lies near the crest of the anticline on the opposite side of the syncline from the above-mentioned mine. The bed has a strike of N. 5° E. and a dip of 20° W.

The bed was measured and sampled in January, 1910, by E. E. Smith, as described below:

Section of coal bed in Brier Hill Mine, ¼ mile west of Wilkeson.

Laboratory No.	9897	
Roof, shale.	*Ft.*	*in.*
Shale, bony [a]	0	1½
Coal, banded	0	6
Bone, fat	0	2
Coal, banded	0	6
Shale, bony	0	½
Coal, banded	0	2
Shale, bony [a]	0	1½
Coal, banded	3	1½
Floor, shale.		
Thickness of bed	4	9
Thickness of coal sampled	4	6

[a] Not included in sample.

The sample was taken on the water-level gangway, 500 feet south of the entrance of the mine.

Notes.—The bed has a low pitch and some of the impurities can be separated in the mine. In preparation for shipment the coal was picked at the bunkers.

For chemical analyses of this coal see part I of this bulletin, p. 221.

For geologic relations see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399-406.

WILKESON. GALE CREEK MINE.

Sample.—Bituminous coal; analyses Nos. 9908, 9909, 9910 (p. 221).

Mine.—Gale Creek, a slope mine in sec. 28, T. 19 N., R 6 E., at Wilkeson, on the Northern Pacific Railway.

Coal beds.—Three coal beds, designated as the No. 1, the No. 2, and the Queen, were being worked at this mine at the time of sampling, in 1909–10. They dip 26 to 60° W. The beds are uniform in thickness throughout the mine, and belong to the same group as those worked at Wilkeson and Carbonado.

The beds were measured and sampled on December 22, 1909, by E. E. Smith, as described below:

Section of No. 1 coal bed in Gale Creek mine at Wilkeson.

Laboratory No.	9908	
Roof, compact shale.	*Ft.*	*in.*
Shale, slate-colored, fissile [a]	0	1
Coal	1	9
Coal, soft	0	½
Coal	1	6
Floor, black, bony shale.		
Thickness of bed	3	4½
Thickness of coal sampled	3	3½

[a] Not included in sample.

Section of No. 2 coal bed in Gale Creek mine at Wilkeson.

Laboratory No.	9909
Roof, compact shale.	*Ft. in.*
Bone, soft[a]	0 1
Coal	3 0
Shale, carbonaceous, "mining"[a]	0 6
Floor, shale, with bands of bone and coal.	
Thickness of bed	3 7
Thickness of coal sampled	3 0

[a] Not included in sample.

Section of Queen coal bed in Gale Creek mine at Wilkeson.

Laboratory No.	9910
Roof, hard shale.	*Ft. in.*
Coal	1 11
Shale, carbonaceous[a]	0 3
Coal	1 4
Floor, shale.	
Thickness of bed	3 6
Thickness of coal sampled	3 3

[a] Not included in sample.

Sample 9908 was taken about 10 feet to the south of the auxiliary slope to the old No. 1 opening and in the first level air course. The coal is overlain with about an inch of fissile shale which loosens from the roof after the coal has been drawn, and mixes to some extent with the coal. The floor of the bed is of black bony shale, which is firm and does not mix with the coal.

Sample 9909 was taken on the second level gangway of the No. 2 bed of the new mine, about 100 feet south of the rock tunnel from this bed to the Queen bed. The bed is overlain with 1 inch of soft bone which mixes somewhat with the coal. It is underlain with 6 inches of carbonaceous shale which was used as a "mining" and was separated from the coal in preparation for the market. This bed had been considered to be the same as No. 1. The workings on these two beds had not been connected and the relation between the two had not been definitely established.

Sample 9910 was taken on the pillar between chutes 3 and 4 on the second level gangway north. Both the roof and floor of the bed are firm and do not mix with the coal.

Notes.—The coal from these beds does not weather on exposure to the sun. All are somewhat higher in sulphur content than the best coals in this region. They have high heating values and should be classed as high-grade bituminous. No attempt was made to separate impurities in the mine. At the bunkers the coal was passed over 1½-inch bar screens. The lump coal was picked by hand and the screenings were washed in a tub washer.

For chemical analyses of this coal see part I of this bulletin, p. 221.

For geologic relations see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436.

WILKESON. WILKESON MINE.

Sample.—Bituminous coal; analyses Nos. 9898, 9899, 9900, 9901, 9902, 9903, 9904, 9905 (p. 221).

Mine.—Wilkeson; a water-level mine in sec. 34, T. 19 N., R. 6 E., at Wilkeson, on the Northern Pacific Railway.

Coal beds.—The coals worked in this mine are the same as the Nos. 1, 2, and 3 (coking) beds at the Carbon Hill mine, Carbonado, and are designated the No. 2, the No. 3, and the No. 7. The beds are considerably folded along north-south axes so that in some parts of the workings the beds dip to the east and in others to the west. They have a strike of from due north and south to N. 30° W., and a dip of from 20 to 60° E. in the parts of the mine worked. They are fairly uniform in thickness in different parts of the mine but the partings are somewhat irregular.

The beds were measured and sampled on January 13 and 14, 1910, by E. E. Smith, as shown below:

Sections of No. 2 coal bed in Wilkeson mine at Wilkeson.

Laboratory No.	9905		9904		9903	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof: 9905, coal; 9904, 9903, shale.						
Shale	[a]0	1½	..	..	..	..
Coal	0	1	[a]1	7	[a]1	7
Coal, bony	..	..	[a]1	6	[a]1	6
Shale	[a]0	1	..	..	..	..
Coal, bony and streaks of coal	..	..	1	5	[a]1	5
Coal	0	9½	[a]0	9½	0	9½
Shale, bony	[a]0	½	[a]0	½	[a]0	½
Coal	0	3	[a]0	5	0	5
Shale, bony	[a]0	1	[a]0	1	[a]0	1
Coal	0	6	[a]1	8½	1	8½
Shale, bony	[a]0	3	[a]0	5	[a]0	5
Coal	2	3	..	..	..	..
Floor, shale.						
Thickness of bed	4	5½	7	11½	7	11½
Thickness of coal sampled	3	10½	1	5	2	11

[a] Not included in sample.

Sections of No. 3 coal bed in Wilkeson mine at Wilkeson.

Laboratory No.	9900		9902		9901	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, bony shale.						
Coal	0	11	1	0	[a]1	0
Shale	[a]0	6	[a]0	6	[a]0	6
Coal	1	0	1	6	[a]1	6
Coal, bony	[a]0	1	[a]0	¼	[a]0	¼
Coal	0	6	0	8½	[a]0	8½
Shale (lens)	..	..	[a]0	1	[a]0	1
Bone	[a]0	½	..	..	..	..
Coal	0	7	0	4	[a]0	4
Coal, impure	1	9½	..	..	..	..
Coal, bony	[a]0	3½	[a]2	5	2	5
Floor, hard shale.						
Thickness of bed	5	8½	6	6¾	6	6¾
Thickness of coal sampled	4	9½	3	6½	2	5

[a] Not included in sample.

Section of No. 7 coal bed in Wilkeson mine at Wilkeson.

Laboratory No.	9899	
	Ft.	*in.*
Coal[a]	1	6
Shale, bony[a]	0	6
Coal	3	6
Coal, bony[a]	0	7
Bone.		
Thickness of bed	6	1
Thickness of coal sampled	3	6

[a] Not included in sample.

Sample 9905 was taken from bed No. 2 about 50 feet up chute 105, on the southeast gangway or water level. The roof of the bed at the place where this sample was taken is fairly firm. It is overlain with soft shale which breaks very readily and necessitates the use of this layer of coal as a roof. The bed is underlain with 6 inches of black shale which was used as a "mining" and was removed by washing.

Sample 9404 was taken from the upper part of the No. 2 bed, at the face of the gangway on the east water level. The face of the gangway the day the sample was taken was 1,200 feet west and 1,500 feet north of the southeast corner of section 34, T. 19 N., R. 6 E. The bed is overlain with about 3 feet of bony coal and coal which is badly broken in this particular part of the mine, and makes a bad roof.

Sample 9903 was taken at the same place where sample 9904 was obtained Pieces of bony coal from the floor mixed with the good coal in mining and had to be removed at the bunkers.

Sample 9902 was taken from the upper part of bed No. 3, about 50 feet up chute 19, on the southeast gangway. The bed is overlain with bony shale which was broken in some parts of the mine and mixed somewhat with the coal.

Sample 9901 was taken from the lower part of bed No. 3 at the same place from which sample 9902 was obtained. The bed is underlain with bony shale, which was broken to some extent in parts of the workings and mixed with the coal.

Sample 9900 was taken from the south end of the east gangway on bed No. 3, at a point about 3,000 feet north and 1,650 feet west of the southeast corner of section 34. The bed is overlain and underlain with bony coal and shale, which mixed to some extent with the coal and were removed at the bunkers.

Sample 9899 was taken from a portion of bed No. 7, exposed in the roof of the gangway, about 100 feet south of the rock tunnel from the west parting to the east gangways, and at a point about 650 feet west and 600 feet south of the north quarter corner of section 34. Pieces of both roof and floor became mixed with the coal in mining

Sample 9898 was taken from the surface of the storage bins containing the rewashed coal which is used in the coke ovens. The sample consisted of about 100 pounds taken in small quantities at random from the surface of the bin. The coal was wet and was sealed in the can while still moist. The coal in the sample was broken to about ¾-inch mesh and reduced by the usual method of quartering to a sample of about 25 pounds. This was then ground to about the size of a pea and quartered by the usual method until the final sample of about 4 pounds was obtained.

Notes.—Most of the coal from this mine is minutely jointed and crumbles readily so that the percentage of lump is very small. It does not slack on exposure to the sun. The washed coal was used as a blacksmith coal.

No attempt was made to separate the partings from the coal in the mine. At the bunkers the coal was passed over a shaking screen with 1¾-inch perforations. The best lump coal was passed through a crusher and mixed with the washed coal from the first set of jigs. The poorer grade of lump was stored in a separate bin and used for steam coal. The screenings were passed through five feldspar-jig washers. They were then rewashed through another set of jig washers before being used for coke. The tailings from the second set of washers were stored in a separate bin and used for the boilers. The equipment in use was capable of handling about 400 tons of coal per day. A new bunker was being installed having a revolving dump and a special jig washer. In this bunker the coal was passed over bar screens having 5½-inch spaces. The oversize from this screen was picked and used for domestic coal. The undersize was passed over a shaking screen with 3-inch perforations. The oversize from this screen was hand picked and conveyed to the bin for steam coal. The undersize was again passed over a screen with ¾-inch mesh. The oversize from this ¾-inch screen was washed through a jig washer and the concentrates were used for steam coal. The undersized from the ¾-inch screen was washed through an improved tub washer and used for coke. The capacity of this plant was about 800 tons per day.

For chemical analyses of this coal see part I of this bulletin, p. 221.

For geologic relations see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436.

Wilkeson. Snell Mine.

Sample.—Bituminous coal; analysis No. 9896 (p. 221).

Mine.—Snell; a slope mine about 2 miles southeast of Wilkeson.

Coal bed.—One coal bed, designated the Snell, had been worked at this mine when it was in operation. The mine had been closed for some time and the slope was flooded nearly to the water level. Most of the water-level gangway was caved in, so that a good sample of the bed could hardly be obtained. This bed is believed to underlie the beds worked at South Willis. It has a strike of about N. 10° W. and a dip of 75° E. The bed is overlain with about 2 inches of carbonaceous shale, which mixes with the coal and must be separated in preparation for the market. A bed of massive sandstone underlies the coal at this point and is separated from it by a thin parting of black shale. This sandstone was reported to be a lens in the main coal bed which had increased from a thickness of a few inches to the northward to several feet in the mine so that only the upper bench could be worked. At the place where the sample was taken the bed is somewhat disturbed and a full section could not be obtained.

The bed was measured and sampled on January 15, 1810,by E. E. Smith, as described below:

Section of coal bed in Snell mine, 2 miles southwest of Wilkeson.

Laboratory No.	9896	
Roof, snale.	*Ft.*	*in.*
Shale, carbonaceous[a]	0	2½
Coal	0	7
Clay[a]	0	½
Coal	1	5
Shale, black[a]	0	1
Floor, sandstone.		
Thickness of bed	2	4
Thickness of coal sampled	2	0

[a] Not included in sample.

The sample was taken from the roof of the first water-level gangway, 75 feet from the entrance and about 10 feet beyond the slope.

Notes.—The coal in this bed is minutely jointed and can be readily crushed in the hand. It is reported to be one of the best blacksmith coals in the State.

For chemical analyses of this coal see part I of this bulletin, p. 221.

For geologic relations see U. S. Geol. Survey 18th Ann. Rept., pt. 3, pp. 399–436.

THURSTON COUNTY.

CENTRALIA. PERTH MINE.

Sample.—Subbituminous coal; analysis No. 9178 (p. 221).

Mine.—Perth; a slope mine in T. 15 N., R. 2 W., 3 miles north of Centralia, on logging road.

Coal bed.—The coal bed worked in this mine dips 20° SW. The roof is of compact shale which broke off in large irregular slabs that became mixed with the coal in mining.

The bed was measured and sampled in 1909 by E. E. Smith, as described below:

Section of coal bed in Perth mine, 3 miles north of Centralia.

Laboratory No.	9178	
Roof, compact, slate-colored shale.	*Ft.*	*in.*
Coal	0	10
Clay, yellow[a]	0	3½
Coal	0	3½
Clay, yellow[a]	0	3
Coal	0	7
Clay, yellow[a]	0	5
Coal	2	8½
Floor, black sandy shale.		
Thickness of bed	5	4½
Thickness of coal sampled	4	5

[a] Not included in sample.

The sample was taken at a point 120 feet north of the foot of the slope, and 40 feet up the dip from the first level gangway.

Three partings of dry yellow clay occur in the bed. They are all of considerable thickness and must be separated in mining. When exposed to the air for a short time they swell to about 1¼ their original thickness, becoming very soft and spongy. All three partings were excluded from the sample.

Notes.—The coal slacks readily when exposed to the air. The shale that fell from the roof was separated from the coal in the mine. At the bunkers the coal was screened and picked by hand.

For chemical analyses of this coal see part I of this bulletin, p. 221.

HURN (TONO). HANNAFORD NO. 1 MINE.

Sample.—Subbituminous coal; analyses Nos. 9089, 9094, 9095, 9096, 9573 (p. 222).

Mine.—Hannaford No. 1; a slope mine in sec. 21, T. 15 N., R. 1 W., at Hurn (Tono), on a spur of the Oregon & Washington Railroad & Navigation Co., off the main line near Centralia.

Coal bed.—Only one of the several coal beds exposed was mined at the time of sampling. The bed is nearly horizontal, having a dip of only 4° NE. A slope had been driven in the lower part of the bed to a distance of about 1,500 feet, and two levels had been driven to the north and three to the south. The mine had been worked almost entirely in the lower bench of the bed. The upper bench had been taken down in one or two rooms on the second level south.

The bed was measured in July, 1909, by E. E. Smith, as shown below:

Section of upper bench of coal bed in Hannaford No. 1 mine at Hurn (Tono).

Laboratory No	9089, 9573	
	Ft.	*in.*
Roof, shale.		
Coal	4	5
Shale [a]	0	1
Coal (lower bench).		
Thickness of bed	4	6
Thickness of coal sampled	4	5

[a] Not included in sample.

Sections of lower bench of coal bed in Hannaford No. 1 mine at Hurn (Tono).

Laboratory No	9094		9095		9096	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal	1	3	1	3½	1	2½
Shale	[a] 0	½	[a] 0	1	[a] 0	1
Coal	1	8½	1	9	1	11½
Shale, carbonaceous	..	..	..	..	[a] 0	½
Clay	[a] 0	1	0	1	..	..
Coal	0	9½	3	2½	0	11½
Shale, brown	0	½	..	..	0	½
Coal	1	8	..	..	1	9½
Shale	0	½	..	..	[a] 0	½
Coal	0	3½	..	..	0	4
Thickness of bed	5	11	6	5	6	5½
Thickness of coal sampled	5	9½	6	4	6	3½

[a] Not included in sample.

Samples 9089 and 9573 were taken from the upper bench, about 150 feet up the slope in room 7 of the second level south. Sample 9573 was taken by removing the surface coal and cutting a fresh channel at the side of the old channel from which sample 9089 was taken. It was taken nine weeks subsequent to the time of taking sample 9089, and had been exposed to the mine atmosphere during the meantime.

Sample 9095 was taken 200 feet from gangway in room 12 on the first level south.

Sample 9094 was collected at the entrance of room 12 on the first level north.

Sample 9096 was taken at the entrance to room 8 on the second level north.

Notes.—The coal weathers readily when exposed to the sun, but withstands transportation for some distance in closed cars. It was shipped in mine-run form, and no attempt was made to separate the shale partings unless they parted readily from the coal in the mine or unless they were of greater thickness than at any point from which the samples were taken. The entire output, aside from the coal used at the mine and in the company town, was used for steam coal.

For chemical analyses of this coal see part I of this bulletin, p. 222.

TENINO. BLACK BEAR MINE.

Sample.—Subbituminous coal; analysis No. 9939 (p. 222).

Mine.—Black Bear; a slope mine in sec. 31, T. 16 N., R. 1 W., about 2 miles southeast of Tenino, on a spur from the Northern Pacific Railway.

Coal bed.—The coal bed from which the sample was taken was exposed in an abandoned mine east of the present slope. It was taken about 30 feet up the first room on the first level west of a slope sunk about 150 feet from the portal of the old gangway. The face from which the coal was obtained had been exposed to the weather for several years.

The bed was measured and sampled on February 15, 1910, by E. E. Smith, as described below:

Section of coal bed in Black Bear mine, 2 miles southeast of Tenino.

Laboratory No.	9939	
Roof, shale.	*Ft.*	*in.*
Coal	2	1
Shale, spongy (varies from 2½ inches to 1 inch) [a]	0	1
Coal	0	8½
Shale, spongy [a]	0	2
Coal	0	5
Shale [a]	0	½
Coal	2	5
Floor, shale.		
Thickness of bed	5	11
Thickness of coal sampled	5	7½

[a] Not included in sample.

The sample was taken from the old workings because a fault had been encountered in the new slope, and a good section of the bed was not exposed there.

Notes.—The coal is brownish black and has a reddish-brown streak; it weathers on exposure to the air. The coal from the mine was prepared for market by screening and hand picking.

For chemical analyses of this coal see part I of this bulletin, p. 222.

TENINO. KING (GREAT WESTERN) MINE.

Sample.—Subbituminous coal; analysis No. 9987 (p. 222).

Mine.—King (Great Western); in sec. 35, T. 16 N., R. 2 W., 3 miles southwest of Tenino, on a branch from the Northern Pacific Railway.

Coal bed.—The bed lies nearly horizontal. At the entrance of the main gangway the bed dips slightly (1 to 2 degrees) eastward and at the far end of the gangway the bed has about the same dip westward. The bed is thin, is subjected to considerable pressure, and much rock work is necessary to keep the gangways open.

The bed was measured and sampled on February 18, 1910, by E. E. Smith, as described below:

Section of coal bed in King (Great Western) mine, 3 miles southwest of Tenino.

Laboratory No	9987	
Roof, shale, with sandstone above.	*Ft.*	*in.*
Coal	0	7
Shale (irregular lenses of coal) [a]	0	3½
Coal	0	4
Shale [a]	0	1
Coal	1	6
Shale, brown [a]	0	1
Coal	1	1
Floor, soft yellow clay and shale.		
Thickness of bed	3	11½
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken in room 10, about 100 feet up the dip from the twenty-fifth level north.

Notes.—The coal is brownish black, and has a reddish-brown streak. It slacks on exposure to the air, although not so readily as some of the other coals from the same region. The coal from the mine was picked and washed at the bunkers, so that a large percentage of the impurities was removed.

For chemical analyses of this coal see part I of this bulletin, p. 222.

WEST VIRGINIA.

BROOKE COUNTY.

COLLIERS. PATTERSON COUNTRY BANK.

Sample.—Bituminous coal; Wheeling field; analysis No. 1586 (p. 222).

Location.—Patterson country bank; Wheeling district; 1 mile south of station at Colliers.

Coal bed.—Pittsburgh. Carboniferous age; Monongahela formation.

For chemical analyses of this coal see part I of this bulletin, p. 222; also U. S. Geol. Survey Prof. Paper 48, p. 275

COLLIERS. POOL COUNTRY BANK.

Sample.—Bituminous coal; Wheeling field; analysis No. 1584 (p. 222).

Location.—Pool country bank; Wheeling district, near Colliers, 1 mile south of station.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation.

The bed was measured and sampled in 1904 by W. T. Griswold. The sample included 4 feet 7 inches of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 222; also U. S. Geol. Survey Prof. Paper 48, p. 136; Bull. 341, p. 89.

For geologic relations see U. S. Geol. Survey Prof. Paper 48, p. 275.

FAYETTE COUNTY.

ALASKA. ALASKA MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8169, 8170, 8294 (pp. 222, 223).

Mine.—Alaska; Kanawha-New River district; a drift mine; 1 mile north of Alaska on the main line of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. The coal as mined ranges in thickness from 3 feet 6 inches to 4 feet 4 inches. The roof is of strong blue shale, which does not fall in the rooms. In the pillar drawing very little of the roof is mixed with the coal. The floor is of hard smooth underclay.

The bed was measured and sampled at two points by J. W. Groves on July 8, 1909, as described below:

Sections of coal bed in Alaska mine, 1 mile north of Alaska.

Section	A		B	
Laboratory No	8169		8170	
	Ft.	*in.*	*Ft.*	*in.*
Roof, gray shale.				
Coal	3	8½	3	7½
Mother coal	..	..	0	½
Coal	..	..	0	5½
Floor, shaly underclay.				
Thickness of bed	3	8½	4	1½
Thickness of coal sampled	3	8½	4	1½

Section A (sample 8169) was cut from a pillar in Bradley's room, about 6,200 feet north of the drift mouth.

Section B (sample 8170) was cut from a pillar in the Davis entry, about 6,500 feet north of the drift mouth.

A composite sample was made by mixing samples 8169 and 8170 for an ultimate analysis, the results of which are shown under laboratory No. 8294.

Notes.—The coal was all loaded as run-of-mine coal. Two men loaded the coal at the tipple, picked slate, and trimmed the cars.

The daily output of the mine at time of sampling in 1909 was 150 tons. The life of the mine was expected to be about 3 years.

For chemical analyses of this coal, see part I of this bulletin, pp. 222, 223.

ANSTED. GAULEY MOUNTAIN MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 8) analyses Nos. 1257, 1258 (p. 223).

Mine.—Gauley Mountain; Kanawha-New River district; a drift mine about 1 mile from Ansted, on the Chesapeake & Ohio Railroad.

Coal bed.—Ansted or No. 2 Gas. Carboniferous age, Kanawha formation. It outcrops on Gauley Mountain, where it averages 4 feet thick. There is a shale parting above the middle of the bed which seldom exceeds 3 inches and is the only persistent parting in the bed. The mine has several drift openings.

Two sections were measured and sampled by J. S. Burrows in 1904, as follows:

Sections of coal bed in Gauley Mountain mine, 1 mile from Ansted.

Section	A		B	
Laboratory No	1257		1258	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	2¼	1	4¾
Shale [a]	0	2¼	0	½
Coal	3	¾	1	10
Sulphur	..	..	Trace.	
Coal	..	..	1	1
Thickness of bed	4	5¼	4	4¼
Thickness of coal sampled	4	3	4	3¾

[a] Not included in sample.

Section A (sample 1257) was measured in room 27, off entry 9.

Section B (sample 1258) was measured in room 15, off entry 15.

Sample 1515 was taken from 35 tons of run-of-mine coal.

Notes.—The coal was used largely for railroad fuel; about 20 per cent of the output in 1904 was made into coke. The rated capacity of the mine in 1904 was 1,560 tons a day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 881; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1258; Bureau of Mines Bull. 13, pp. 216, 276; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1362; Bull. 261, p. 128; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1385.

For chemical analyses, see part I of this bulletin, p. 223; also U. S. Geol. Survey Bull. 261, p. 56.

BALLINGER. BALLINGER NO. 1 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8146, 8154, 8155, 8608, 8195 (p. 223).

Mine.—Ballinger No. 1; Kanawha-New River district; drift mines, ½ mile north of Ballinger and ½ mile south of Winona, on the Keeney's Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging from 3 feet 2 inches to 4 feet; roof, rather soft light-gray slate, which does not fall with the coal; floor, soft underclay with smooth surface.

The bed was measured and sampled at three points by R. Y. Williams on July 8, 1909, and at one point by A. J. Hazlewood on July 26, 1909, as described below:

Sections of coal bed in Ballinger No. 1 mine, ½ mile north of Ballinger.

Section	A		B		C		D	
Laboratory No.	8146		8154		8155		8608	
Roof, soft, light-gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft, bright coal, short-grained	0	4¾	0	9	1	8	1	7
Hard, dense, dull-gray coal	0	1½	0	1	0	3½	0	½
Soft, bright coal	0	2½	0	1	..	..	..	..
Hard, dense, dull-gray coal	0	¾	0	1¼	..	..	..	..
Soft, bright coal (mother-coal streaks)	2	2¾	2	2	2	3¼	2	1¼
Floor, soft clay.								
Thickness of bed	3	¼	3	2¼	4	2¾	3	8¾
Thickness of coal sampled	3	¼	3	2¼	4	2¾	3	8¾

Section A (sample 8146) was cut from the face of entry 6, Klondike side.

Section B (sample 8154) was cut from the face of drift 2, Egypt side, 600 feet from drift mouth.

Section C (sample 8155) was cut from the face of left entry 6, in Egypt No. 1.

Section D (sample 8608) was cut from the face of left entry 6, 2,000 feet from drift mouth.

A composite sample was made by mixing samples 8154 and 8146 for an ultimate analysis, the results of which are shown under laboratory No. 8195.

Notes.—The coal at these mines was cut by hand in the upper part of the bed and then shot down. There were no coke ovens at this plant, the coal being shipped as run-of-mine. The daily output in July, 1909, averaged 450 tons, and 500 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 223.

BELVA. PAGE PROSPECT.

Sample.—Semibituminous coal; Kanawha field; analysis No. 10476 (p. 223).

Location.—Page prospect; Kanawha-New River district; on Rush Creek, 1 mile above mouth, 3 miles from Belva.

Coal bed.—"Eagle" or No. 1 Gas. Carboniferous age, Pottsville formation.

The bed was measured and sampled on May 17, 1910, by W. R. Calvert, as shown below:

Section of coal bed in Page prospect, 3 miles from Belva.

Laboratory No	10476	
	Ft.	*in.*
Crumbly cannel [a]	0	3
Cannel	1	4
Cannel [a]	1	3½
Coal, bituminous [a]	2	11
Thickness of bed	5	9½
Thickness of coal sampled	1	4

[a] Not included in sample.

The sample was taken 140 feet in drift.

For chemical analyses of this coal see part I of this bulletin, p. 223.

BOONE. BOONE MINE.

Sample.—Semibituminous coal; New River field. Analyses Nos. 8137, 8138, 8139, 8193 (p. 223).

Mine.—Boone; Kanawha-New River district; a drift mine, ½ mile from Boone on the Keeney's Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 3 feet 2 inches to 4 feet 10 inches; there is a "fault" on one side of the mine; roof, strong blue shale which does not fall with the coal; floor, fairly hard underclay with smooth surface and underlain with hard shale; cover, for the most part, 200 to 250 feet.

The bed was measured and sampled at three points by A. C. Ramsay on July 8, 1909, as described below:

Sections of coal bed in Boone mine, ½ mile from Boone.

Section	A		B		C	
Laboratory No	8137		8138		8139	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard bright coal	1	1¼	..	..	..	..
Medium hard bright coal	..	..	0	11½	1	¼
Hard gray coal	0	2¾	0	1½	0	¾
Hard bright coal (mother-coal streaks)	0	7	..	..	..	..
Medium hard bright coal	..	..	0	4	0	1½
Hard gray coal	0	1½	0	1	0	¾
Hard bright coal (mother-coal streaks)	2	8¾	..	..	..	..
Medium hard bright coal	..	..	2	8	2	0
Floor, fairly hard underclay.						
Thickness of bed	4	9¼	4	2	3	3¼
Thickness of coal sampled	4	9¼	4	2	3	3¼

Section A (sample 8137) was cut from the face of right entry 4, 2,000 feet from drift mouth.

Section B (sample 8138) was cut from the face of the old main entry, 1,800 feet from drift mouth.

Section C (sample 8139) was cut from right entry 4, 2,000 feet from drift mouth.

A composite sample was made by mixing samples 8137, 8138, and 8139 for an ultimate analysis, the results of which are shown under laboratory number 8193.

Notes.—The coal from this mine was undercut in the bottom part of bed with chain machines and was shot down with black powder. The tipple was not equipped with screens, so that the entire output was shipped in run-of-mine form. There was one loading track. The coal was picked on the car. The daily output averaged 400 tons, and 500 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin (p. 223).

CARLISLE. CARLISLE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7880, 7881, 8080, 8702, 8703, 8166, (pp. 223, 224).

Mine.—Carlisle; Kanawha-New River district; a shaft mine, 475 feet in depth, at Carlisle, on the White Oak Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, not very uniform, ranging as mined from 3 feet 5 inches to 5 feet 1 inch; main roof, sandstone underlain with shale. Floor, shaly underclay of variable hardness.

The bed was measured and sampled at two points on June 3, 1909, and at one point on July 3, 1909, by F. J. Simington, and at two points on August 6, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Carlisle mine at Carlisle.

Section	A	B	C	D	E
Laboratory No	7880	7881	8080	8702	8703
Roof, shale.	Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.
Bony coal[a]	.. ..	0 3	0 5	.. ..	.. ..
Coal	.. ..	0 8	1 8	1 2½	.. ..
Pyrite	.. ..	0 ¼	.. ..	.. ..	.. ..
Coal	1 2	1 2½	.. ..	.. ..	0 9½
Hard gray coal	0 2	0 8	0 1	1 6	1 4½
Coal	3 4	1 5½	1 10½	2 4¼	1 3½
Floor, shaly underclay.					
Thickness of bed	4 8	4 3¼	4 ½	5 ¾	3 5½
Thickness of coal sampled	4 8	4 ¼	3 7½	5 ¾	3 5½

[a] Not included in sample.

Section A (sample 7880) was cut from left airway 1, off main entry, about 3,000 feet northwest of shaft.

Section B (sample 7881) was cut from right entry 2, off left entry 2, about 2,000 feet south of shaft.

Section C (sample 8080) was cut from rib near face of right entry 6, about 2,800 feet south of shaft.

Section D (sample 8702) was cut from face of left entry 1, off northwest entry 1, about 2,500 feet from shaft.

Section E (sample 8703) was cut from face right entry 3, about 3,700 feet southwest of shaft.

A composite sample has been made by mixing samples 7880, 7881, and 8080 for an ultimate analysis, the results of which are shown under laboratory No. 8166.

Notes.—Three sizes of coal were prepared at this mine: Lump, over 5-inch openings; egg, over 2-inch openings, and slack, under 2-inches in diameter. The lump and egg were mixed and shipped as one product. The mining was done in the bed entirely by hand, and the coal was shot down with short-flame explosives. The coal was picked on the car by two trimmers. The daily output in 1909 averaged 350 tons, and 700 tons was approximately the capacity of the mine.

For chemical analyses of this coal see part I of this bulletin, pp. 223, 224.

CARLISLE. OAKWOOD MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7876, 7877, 8171, 8606, 8251 (p. 224).

Mine.—Oakwood; Kanawha-New River district; a shaft mine 432 feet in depth; at Carlisle, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness fairly uniform, ranging as mined from about 3 feet 6 inches to about 5 feet; roof, shale; floor, shale, sometimes soft. Cover, for the most part, more than 500 feet.

The bed was measured and sampled at two points by F. J. Simington on June 2, 1909, and at one point by A. J. Hazlewood on July 28, 1909, as described below:

Sections of coal bed in Oakwood mine at Carlisle.

Section	A	B	C	D
Laboratory No	7876	7877	8171	8606
Roof, shale.	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*
Soft coal (mother-coal streaks)	1 10⅝	1 6¼	0 7½	0 9
Gray granular coal (much mother coal)	.. ..	.. ..	0 5¾	.. ..
Hard gray coal	0 3	0 2	0 1¼	0 1½
Coal (mother-coal streaks)	2 8⅞	2 10¼	1 10¼	0 6
Mother coal	.. ..	.. ..	0 ½	0 ⅜
Soft coal (mother-coal streaks)	.. ..	.. ..	0 8¼	2 1¼
Bony coal[a]	.. ..	.. ..	.. ..	0 2
Floor, shale.				
Thickness of bed	4 10½	4 6½	3 9½	3 8⅛
Thickness of coal sampled	4 10½	4 6½	3 9½	3 6⅛

[a] Not included in sample.

Section A (sample 7876) was cut from face of left entry 1, off main entry, about 3,000 feet northeast of shaft.

Section B (sample 7877) was cut from room 20 at face of right entry 1, about 4,000 feet north of shaft.

Section C (sample 8171) was cut from room 4 off right entry 2, about 2,000 feet from shaft.

Section D (sample 8606) was cut from room 4 off right entry 2, about 3,500 feet from shaft.

A composite sample was made by mixing samples 7876 and 7877. The results of an ultimate analysis of this sample are shown under laboratory No. 8251.

Notes.—The coal was mined by hand in the rooms and by punching machines in the entries. The tipple at the time of inspection in 1909 was equipped with screens of the fixed diamond-bar pattern. Three sizes were made and shipped from this mine: Lump, over 5-inch openings; egg, over 2-inch openings, and slack. The coal was picked on the car by two trimmers. The daily output averaged about 700 tons. It was derived almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 224.

CLAREMONT. BEECHWOOD MINES NOS. 1 AND 2.

Sample.—Semibituminous coal; New River field; analyses Nos. 8059, 8060, 8063, 8115, 8293 (pp. 224, 225).

Mine.—Beechwood Nos. 1 and 2; Kanawha-New River district; drift mines, operating the same bed but using separate tipples; ½ mile northeast of Claremont, on the Chesapeake & Ohio Railway.

Coal bed.—Known as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, fairly uniform, ranging as mined from 3 feet 6 inches to 4 feet 7 inches;

dip, 1° NW.; roof, blue carbonaceous slate 4 feet to 8 feet thick, which does not fall with the coal; floor, hard clay with smooth surface; cover, for the most part, 50 to 300 feet.

The bed was measured and sampled at three points by R. Y. Williams on July 1, 1909, and at two points on July 2, 1909, as described below:

Sections of coal bed in Beechwood mine No. 1, ½ mile northwest of Claremont.

Section	A		B		C	
Laboratory No	8060		8062		8063	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, blue carbonaceous shale.						
Soft bright coal (mother-coal streaks)	0	8⅛	0	7	0	2
Gray band, slightly bony	0	1	0	1⅛	0	⅛
Soft bright coal (mother-coal streaks)	0	6¾	1	2¾	1	¾
Granular, dense, lumpy coal	0	11¾	..	..	..	..
Hard gray band, coarse	0	4	0	5½	0	2¼
Clean coal, becoming less granular	0	10¾	0	7	..	..
Soft bright coal (mother-coal streaks)	1	⅛	1	4½	0	10½
Bright hard coal	..	..	..	..	0	9
Soft bright coal	..	..	..	..	1	6
Bony shale	0	⅝	..	..	..	..
Floor, hard stigmaria clay.						
Thickness of bed	4	7⅛	4	3⅞	4	6⅝
Thickness of coal sampled	4	7⅛	4	3⅞	4	6⅝

Section A (sample 8060) was cut from the face of the Simpson entry.

Section B (sample 8062) was cut from the face of the Harry Jones entry.

Section C (sample 8063) was cut from the face of the Beechwood main entry.

A composite sample was made by mixing samples 8060, 8062, and 8063 for an ultimate analysis, the results of which are shown under laboratory No. 8115.

Sections of coal bed in Beechwood mine No. 2, ½ mile northwest of Claremont.

Section	A		B	
Laboratory No	8059		8061	
	Ft.	*in.*	*Ft.*	*in.*
Roof, blue carbonaceous shale.				
Soft bright coal	0	5	0	2¾
Granular coal	0	1½	..	..
Mother coal	..	..	0	¼
Soft bright coal	0	4½	0	6
Harder gray coal	0	1	0	1½
Soft bright coal (mother-coal streaks)	0	7	0	11½
Gray coal	..	..	0	½
Soft bright coal	1	3	1	0
Mother coal	..	..	0	¼
Soft bright coal	0	7¾	0	10¼
Floor, hard stigmaria clay.				
Thickness of bed	3	5¾	3	9
Thickness of coal supplied	3	5¾	3	9

Section A (sample 8059) was cut from the face of the John Porter entry.

Section B (sample 8061) was cut from the face of the Old Folks entry.

A composite sample was made by mixing samples 8059 and 8061 for an ultimate analysis, the results of which are shown under laboratory No. 8293.

Notes.—The coal at these mines was undercut by hand in bottom part of bed, and was shot down with black powder. It is a coking coal, but there were no ovens at this plant. The entire output was shipped in run-of-mine form. The daily output in July, 1909, averaged 400 tons, and 600 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 224, 225.

DERRYHALE. DERRYHALE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 5404, 5431 (Jamestown No. 7) and analyses Nos. 8005, 8006, 8023, 8113 (p. 225).

Mine.—Derryhale; Kanawha-New River district; a drift mine at Derryhale, 1½ miles southeast of Glen Jean, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell of the West Virginia Geological Survey. Carboniferous age, in the Sewell formation. At this mine the bed lies nearly flat. Thickness, fairly uniform, ranging as mined from 4 feet 6 inches to 5 feet 6 inches; roof, shale, varying from 0 to 6 feet and capped with a heavy bedded sandstone; roof rarely falls with the coal; floor, fairly hard clay with smooth surface; cover, for the most part, 50 to 200 feet thick.

The bed was measured and sampled at three points by H. M. Wolflin, on June 23, 1909, as described below:

Sections of coal bed in Derryhale mine at Derryhale.

Section	A		B		C	
Laboratory No	8005		8006		8023	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Rather hard bright coal	1	1½	1	1	0	8¼
Soft bright coal	0	5½	0	7½	0	9¼
Bright coal	0	11¾	0	11½	0	9¾
Hard silvery gray coal	0	1½	0	¾	0	2¾
Bright coal	2	1	2	1¾	2	1⅛
Bone [a]	0	4⅛	0	1½	..	..
Bright coal	0	4⅝	0	5¾	..	..
Floor, fairly hard clay.						
Thickness of bed	5	6	5	5¾	4	7⅛
Thickness of coal sampled	5	1⅞	5	4¼	4	7⅛

[a] Not included in sample.

Section A (sample 8005) was cut from the face of right entry 8, off the new main entry, 3,100 feet south of drift mouth.

Section B (sample 8006) was cut from the face of room 10, on left entry 5, off the new main entry, 3,500 feet southeast of drift mouth.

Section C (sample 8023) was cut from a pillar in room 21, on Price's air course, 3,800 feet northwest of drift mouth.

A composite sample was made by mixing both the pillar and the face samples 8005, 8006, and 8023. The results of an ultimate analysis of this sample are shown under laboratory No. 8113.

The bed was also measured and sampled at two points in the mine by K. M. Way, on September 23, 1907, as shown below:

Sections of coal bed in Derryhale mine at Derryhale.

Section	A		B	
Laboratory No	5404		5431	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal	0	8	..	..
Coal	..	..	0	2¼
Soft coal	1	8½	..	..
Mother coal and sulphur	..	..	0	¼
Hard coal	1	9½	..	..
Coal	..	..	0	2½
Mother coal	0	¼	..	..
Mother coal and sulphur	..	..	0	⅛
Coal	0	4¼	..	..
Hard coal	..	..	0	5½
Mother coal	0	¼	..	..
Soft coal	..	..	0	8
Coal	0	3¾	0	11
Hard coal	..	..	0	7½
Mother coal	..	..	0	¼
Coal	..	..	0	11½
Mother coal	..	..	0	¼
Coal	..	..	0	1¼
Mother coal	..	..	0	⅛
Coal	..	..	0	4
Floor, shale.				
Thickness of bed	4	10½	4	6½
Thickness of coal sampled	4	10½	4	6½

Section A (sample 5404) was measured in the face of an air course, 3,500 feet northwest of the mine mouth.

Section B (sample 5431) was measured in left entry 4, off the new main entry, 3,000 feet southeast of the drift mouth.

Notes.—The coal from this mine, like that from other mines in the field, is a noted steam coal, and the output in 1909 was sold chiefly for steam production. The coal was undercut both by hand and with chain machines in the bottom part of the bed, and was shot down with short-flame explosives and black powder. The tipple was not equipped with screens, so that the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on the car. The daily output in June, 1909, averaged 500 tons, and 750 tons was the maximum day's run. The future output for some time to come was to be derived mainly from advance work.

For results of briquetting tests of this coal see U. S. Geol. Survey Bull. 385, p. 21.

For chemical analyses see part I of this bulletin, p. 225; also U. S. Geol. Survey Bull. 362, p. 15.

DUNGLEN. DUNGLEN MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7994, 8220, 8221, 7992, 8295 (p. 225).

Mine.—Dunglen; Kanawha-New River district, a drift mine at Dunglen, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—The principal workings are in what is known in this field as the Sewell bed. The Fire Creek bed is also worked. Carboniferous age, Sewell and Quinnimont formations. Thickness, even, ranging as mined from 4 feet 2 inches to 4 feet 8 inches; roof, sandstone, between which and the coal there is a weak "slippy" gray shale, the sandstone in places coming down on top of the coal.

The bed was measured and sampled at one point by H. M. Wolflin on June 18, 1909, and at two points by H. M. Wolflin on July 14, 1909, as described below.

There are also some prospect drifts in what is known in this field as the Fire Creek bed, a bituminous coal of Carboniferous age, Quinnimont formation, which underlies the Sewell about 350 feet. This bed was measured and sampled at one point by G. S. Rice, David White, G. S. Pope, and H. M. Wolflin, June 18, 1909, as described below:

Section of Fire Creek coal bed in prospect drift of Dunglen mine at Dunglen.

Laboratory No.	7992	
Roof, miner's shale with coal partings.	*Ft.*	*in.*
Bony coal[a]	1	1
Bright coal	1	11½
Hard coal	0	1¼
Floor, hard, smooth underclay.		
Thickness of bed	3	1¾
Thickness of coal sampled	2	¾

[a] Not included in sample.

Sample 7992 was cut from face of left entry 1, about 600 feet almost east from drift mouth.

Sections of Sewell coal bed in Dunglen mine at Dunglen.

Section	A		B		C	
Laboratory No.	7994		8221		8220	
Roof, sandstone or gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal (occasionally streaked with pyrite)	3	5½	0	5½	1	5½
Mother coal	0	1½	..	..	..	..
Bright grayish coal	..	..	0	9½	..	..
Hard gray coal	..	..	0	3¼	0	1⅛
Grayish coal	..	..	0	10	0	10
Bright coal (mother-coal streaks)	0	11⅜	1	11½	1	11⅜
Floor, hard smooth shaly underclay.						
Thickness of bed	4	6⅜	4	3¾	4	4
Thickness as sampled	4	6⅜	4	3¾	4	4

Section A (sample 7994) was cut from room 1 off right entry 2, about 600 feet northwest of drift mouth.

Section B (sample 8221) was cut from room 3 off left entry 5 off main entry 3, about 1,400 feet approximately N. 45° W. of drift mouth.

Section C (sample 8220) was cut from face of left 6 off main 4, about 800 feet approximately N. 45° W. of drift mouth.

A composite sample was made by mixing samples 7994, 8220, and 8221 for an ultimate analysis, the results of which are shown under laboratory No. 8295.

Notes.—The coal was undercut in bottom part of bed partly with chain machines, but principally by hand, and was shot down with black powder or a permissible explosive. Tipples at each bed were connected by same gravity plane to bins loading into railroad cars at the bottom of the hill; the arrangement was such that the coal from the two beds might be mixed or not, as desired. There were no screens, and consequently the whole output was shipped as run-of-mine coal. The daily output averaged about 200 to 300 tons, the capacity being about 400 tons. The future output was to be derived from both advance work and pillars in the Sewell bed; the Fire Creek bed was as yet not well developed.

For chemical analyses of this coal see part I of this bulletin, p. 225.

DUNLOOP. DUNN LOOP NO. 2 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7984, 7985, 8603, 8604, 8605, 8744 (p. 226).

Mine.—Dunn Loop No. 2; Kanawha-New River district; a drift mine 1¼ miles southeast of Dunloop, on the Loop Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, varying as mined from 5 feet 4 inches to 6 feet 3 inches; main roof, sandstone, between which and the coal is a weak shale, which in places falls with the coal; the floor is a shaly underclay with smooth surface.

The bed was measured and sampled at two points on June 17, 1909, by J. J. Rutledge and H. M. Wolflin, and at three points on July 29, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Dunn Loop No. 2 mine, 1¼ miles southeast of Dunloop.

Section	A		B		C		D		E	
Laboratory No.	7984		7985		8603		8604		8605	
Roof, shale, or draw shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	¼	..	..	..	..	..	..	..	..
Bright coal	2	8	2	3¾	1	8½	1	9	2	2¼
Hard gray coal	0	9	0	1⅜	1	½	1	2	0	8½
Bright coal	1	6¾	..	..	2	6	2	10½	2	5¾
Bony and bright coal	0	1¼	..	..	..	..	..	..	..	..
Clay [a]	0	1½	..	..	..	..	..	..	..	..
Coal (sometimes mother-coal streaks)	0	8¾	2	10	..	..	..	..	..	..
Clay streaked with coal [a]	0	1¼	..	..	..	..	..	..	..	..
Soft bony coal	..	..	..	..	0	5½	..	..	..	..
Floor, shaly underclay.										
Thickness of bed	6	¾	5	3⅛	5	8½	5	9½	5	4½
Thickness of coal sampled	5	9¾	5	3⅛	5	8½	5	9½	5	4½

[a] Not included in sample.

Section A (sample 7984) was cut from the face of right entry 1, off entry 4, about 3,550 feet northeast of drift mouth.

Section B (sample 7985) was cut from right entry 10, about 5,200 feet east of drift mouth.

Section C (sample 8603) was cut from break-through, 50 feet from face of main entry, 4,000 feet from drift mouth.

Section D (sample 8604) was cut from face of right entry 2, 2,000 feet from second drift mouth.

Section E (sample 8605) was cut from face of right entry 1, off entry 4, about 3,600 feet northeast of drift mouth.

A composite sample was made by mixing samples 8603, 8604, and 8605 for an ultimate analysis, the results of which are shown under laboratory No. 8744.

Notes.—The coal was mined entirely by hand—usually in the middle of the bed—and was shot down generally with black powder, though sometimes permissible explosives were used. The daily output in July, 1909, averaged about 800 tons; the capacity of the mine was about 1,000 tons. The future output was to be derived from advance work for several years. Dunn Loop No. 1 mine is 1½ miles distant; it was nearly exhausted but still contained some pillar coal. It was not working and not accessible at the time of visiting No. 2 mine.

For chemical analyses of this coal see part I of this bulletin, p. 226.

EAST SEWELL. BROOKLYN MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 5329 and 5432 (Jamestown No. 5) and analyses Nos. 8092, 8093, 8094, 8159, 5329, 5432 (p. 226).

Mine.—Brooklyn; Kanawha-New River district; a drift mine on New River, opposite East Sewell (at Finlow P. O.), on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. At this mine the bed lies nearly flat, having about 3½ feet thickness. Roof, sandstone, or sandstone underlain with clay to which the coal sticks somewhat; floor, fire clay, or smooth, soft shale which does not mix with coal in mining.

The bed was measured and sampled at two points in the mine by K. M. Way on September 14, 1907, as shown below:

Sections of coal bed in Brooklyn mine near East Sewell.

Section	A		B	
Laboratory No.	5329		5432	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	10½	0	9¼
Hard coal	0	3	0	3
Coal	2	10	1	6¼
Mother coal	..	..	0	¼
Coal	..	..	0	10
Mother coal	..	..	0	¼
Coal	..	..	0	7
Floor, fire clay.				
Thickness of bed	3	11½	4	0
Thickness of coal sampled	3	11½	4	0

Section A (sample 5329) was measured in the face of left entry 5, 3,000 feet east of the drift mouth.

Section B (sample 5432) was measured in the face of right entry 1, 1,500 feet west of the drift mouth.

The bed was also measured and sampled at three points by C. A. Fisher on July 4, 1909.

Section A (sample 8092) was cut from left heading 2, and represented 4 feet 2 inches of coal.

Section B (sample 8093) was cut from the face of straight entry 7, and represented 3 feet 9 inches of coal.

Section C (sample 8094) was cut from right block entry 1, and represented 3 feet 8½ inches of coal.

A composite sample was made by mixing both face and pillar samples 8092, 8093, 8904 for an ultimate analysis, the results of which are shown under laboratory No. 8159.

Notes.—About 50 per cent of the output of this mine was shipped as run-of-mine coal. The remainder was screened and the slack was coked. The coal was picked on the car by two trimmers. The daily output in July, 1909, averaged about 350 tons, and 500 tons was a maximum day's run. Increase of capacity was contemplated. The probable life of the mine was estimated at 20 years.

For chemical analyses of this coal see part I of this bulletin, p. 226; also U. S. Geol. Survey Bull. 362, p. 13.

EDMOND. KEENEYS CREEK MINE.

Sample.—Semibituminous coal; New River field; analyses 8140, 8141, 8190 (p 227).

Mine.—Keeneys Creek; Kanawha-New River district; a drift mine; 1½ miles from Edmond, on the Chesapeake & Ohio Railway.

Coal bed.—Sewell. Carboniferous age, Sewell formation. The thickness averages 3½ feet. The roof is a hard gray shale, between which and the coal is a 2-inch layer of draw slate. The floor is a soft underclay with a smooth surface. No pieces of roof or floor got mixed with coal in loading. There is a caprock of sandstone 20 feet above the coal.

The bed was measured and sampled at two points by A. C. Ramsay, July 9, 1909, as described below:

Sections of coal-bed in Keeneys Creek mine, near Edmond.

Section	A		B	
Laboratory No.	8140		8141	
Roof, hard gray shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	1¾	..	..
Coal, soft bright	0	8¾	0	8¾
Coal, hard gray	0	1⅛	0	¾
Coal, soft bright (mother-coal streaks)	0	3	..	..
Coal, soft bright	..	..	0	4⅝
Coal, hard gray	0	1½	0	⅝
Coal, soft bright (mother-coal streaks)	2	0	1	11
Floor, soft shale.				
Thickness of bed	3	4⅛	3	1¾
Thickness of coal sampled	3	2⅜	3	1¾

[a] Not included in sample.

Section A (sample 8140) was cut from entry 3, off Virginia entry, 1,700 feet from drift mouth.

Section B (sample 8141) was cut from straight heading, 2,600 feet from drift mouth.

A composite sample was made by mixing samples 8140 and 8141 for an ultimate analysis, the results of which are shown under laboratory number 8190.

Notes.—The coal in this mine was undercut by hand in the bottom of the bed. Explosives used for shooting down the coal were of the permissible type and also black blasting powder. The coal was shipped in run-of-mine form because the plant was not equipped with screens. The daily output in 1909 averaged 125 tons and 225 tons was a maximum day's run. The future output was to be increased to 250 tons. The mine had 200 acres of unmined coal.

For chemical analyses of this coal see part I of this bulletin, p. 227.

ELMO. SUNNYSIDE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8068, 8069, 8244, 8287 (p. 227).

Mine.—Sunnyside; Kanawha-New River district; a drift mine; at Elmo, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from about 2 feet 8 inches to 3 feet; roof, sandstone, in places underlain with slate, which in places falls with the coal; floor, hard smooth underclay.

The bed was measured and sampled at three points by C. David White, C. A. Fisher, and A. J. Hazlewood on July 3, 1909, as described on the following page.

Sections of coal bed in Sunnyside mine at Elmo.

Section	A		B		C	
Laboratory No	8068		8069		8244	
Roof, sandstone or shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft coal	0	10¼	..	..	0	5⅞
Dense hard coal	..	..	..	..	0	⅜
Bony coal	0	1	..	..	..	..
Grayish coarse granular coal	..	..	..	..	0	5¾
Coal (sometimes mother-coal streaks)	1	11¾	2	8½	1	6⅜
Dense bone	..	..	..	..	0	¼
Clean coal	..	..	..	..	0	1⅝
Floor, hard smooth underclay.						
Thickness of bed	2	11	2	8½	2	8¼
Thickness of coal sampled	2	11	2	8½	2	8¼

Section A (sample 8068) was cut from the face of main air course.

Section B (sample 8069) was cut from last room on Abraham entry, off fourth right parting.

Section C (sample 8244) was cut from a point 4,000 feet north and 60 degrees east of drift mouth.

A composite sample was made by mixing samples 8068, 8069, and 8244 for an ultimate analysis, the results of which are shown under laboratory No. 8287.

Notes.—The coal was taken from the tipple to bins above the railroad car. These bins were formerly equipped with bar screens, but at time of sampling the screens were not used, the entire output being shipped as run-of-mine coal. The daily output in 1909 averaged about 120 tons, and 500 tons was the capacity of the mine. The future tonnage was to be derived entirely from advance work for some time to come. The unmined area to be taken out from the opening was approximately 50 acres.

For chemical analyses of this coal see part I of this bulletin, p. 227.

FAYETTE. NEWLYN MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8216, 8217, 8704, 8705, 9147 (p. 227).

Mine.—Newlyn; Kanawha-New River district: a drift mine; ½ mile west of Fayette, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness ranges as mined from about 2 feet to 2¾ feet; roof, hard blue shale, usually underlain with a few inches of bone, between which and the shale there is in places a few inches of draw slate; floor, hard shaly underclay, between which and the coal there is in places a few inches of bone; cover, for the most part, 100 feet or more.

The bed was measured and sampled at two points on July 13, 1909, by H. M. Wolflin, and at two points on August 5, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Newlyn mine, ½ mile west of Fayette.

Section	A		B		C		D	
Laboratory No	8216		8217		8704		8705	
Roof, hard blue shale or bone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (sometimes mother-coal streaks)	..	..	0	6¼	1	2¼	0	10½
Hard gray coal	1	0	0	¾	..	..	0	1
Coal (mother-coal streaks)	1	1½	1	5	0	11½	1	9
Floor, bone or hard shaly underclay.								
Thickness of bed	2	1½	2	0	2	1¾	2	8½
Thickness of coal sampled	2	1½	2	0	2	1¾	2	8½

Section A (sample 8216) was cut from the face of entry 8, about 2,450 feet, approximately southeast of drift mouth.

Section B (sample 8217) was cut from cross-cut, near face of entry 1, about 2,500 feet northeast of drift mouth.

Section C (sample 8704) was cut from face of face entry 2, about 2,450 feet southeast of drift mouth.

Section D (sample 8705) was cut from face of room 8, off left entry 3, about 1,500 feet from drift mouth.

A composite sample was made by mixing samples 8217, 8704, and 8705 for an ultimate analysis, the results of which are shown under laboratory No. 9147.

Notes.—The coal was undercut by hand in the bed, and was shot down with black powder. The tipple was not equipped with screens, so the entire output was shipped as run-of-mine coal. The estimated output in 1909 was about 275 tons daily, and 360 tons was a maximum day's run. The tonnage for some time to come was to be derived principally from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 227.

GENTRY. LAYLAND MINES NOS. 1, 2, AND 3.

Sample.—Semibituminous coal; New River field; analyses Nos. 8346, 8347, 8348, 8349, 8425, 8234, 8235, 8236, 8237, 8298, 8350 (pp. 227, 228).

Mine.—Layland, Nos. 1, 2, and 3; Kanawha-New River district; drift mines at Gentry, on the Laurel Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek seam. Carboniferous age, Quinnimont formation. Thickness, uniform, ranging from 3 feet 6 inches to 4 feet 2 inches; roof, strong gray shale, which does not fall when the coal is mined; floor, hard gray underclay, with a smooth surface. The cover is from 50 to 600 feet.

The bed was measured and sampled at four points in No. 1 mine, four points in No. 2 mine, and one point in No. 3 mine by J. W. Groves and J. J. Rutledge, on July 13, 1909, as described below:

Sections of coal bed in Layland No. 1 mine at Gentry.

Section	A		B		C		D	
Laboratory No.	8346		8347		8348		8349	
Roof, strong gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	10	1	1	1	3½	0	9
Mother coal	0	½	0	¼	0	¼	0	¼
Coal	0	2	2	1½	2	4	2	0
Gray band	0	2	..	..	..	..	..	..
Coal	2	1	..	..	..	..	..	..
Shale [a]	0	1¼	..	..	..	..	..	..
Coal [a]	0	3	..	..	..	..	..	..
Mother coal	..	..	0	¾	0	½	0	1
Coal	..	..	0	5	0	6½	1	0
Floor, hard gray underclay.								
Thickness of bed	3	7¾	3	8½	4	2¾	3	10¼
Thickness of coal sampled	3	3½	3	8½	4	2¾	3	10¼

[a] Not included in sample.

Section A (sample 8346) was cut from the face of the main entry, 5,000 feet east of the drift mouth.

Section B (sample 8347) was cut from the face of left entry 9, 3,500 feet east of drift mouth.

Section C (sample 8348) was cut from the face of room No. 14 on left entry 6, 2,400 feet east of the drift mouth.

Section D (sample 8349) was cut from the pillar of room 4 on left entry 4, 1,100 feet east of the drift mouth. This sample is of pillar coal.

A composite sample was made by mixing samples 8346, 8347, 8348, and 8349 for an ultimate analysis, the results of which are shown under laboratory number 8425.

Sections of coal bed in Layland No. 2 mine at Gentry.

Section	A		B		C		D	
Laboratory No.	8234		8235		8236		8237	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	7¾	3	0	2	10	3	5
Mother coal	0	½	0	½	..	..	0	½
Coal	0	5	0	4	..	..	0	4½
Mother coal	..	..	0	½	..	..	..	..
Coal	..	..	0	5	..	..	..	..
Soft sulphur [a]	..	..	..	..	0	½	..	..
Coal	..	..	..	..	0	7	..	..
Mother coal	..	..	..	..	0	½	..	..
Coal	..	..	..	..	0	3¾	..	..
Floor, hard underclay.								
Thickness of bed	4	1¼	3	10	3	9¾	3	10
Thickness of coal sampled	4	1¼	3	10	3	9¼	3	10

[a] Not included in sample.

Section A (sample 8234) was cut from the face of the main heading, 5,300 feet northeast of the drift mouth.

Section B (sample 8235) was cut from pillar of left entry 5, 2,500 feet west of the drift mouth.

Section C (sample 8236) was cut from the face of left entry 10, 5,200 feet west of the drift mouth.

Section D (sample 8237) was cut from the face of room 16 on right entry 5.

A composite sample was made by mixing samples 8234, 8235, 8236, and 8237 for an ultimate analysis; the results of the analysis are shown under laboratory number 8298.

Section of coal bed in Layland mine No. 3 at Gentry.

Laboratory No.	8350	
Roof, strong gray shale.	*Ft.*	*in.*
Coal and shale (thin layers) [a]	0	2
Coal	2	9¾
Mother coal	0	¼
Coal	0	4
Floor, hard gray underclay.		
Thickness of bed	3	4
Thickness of coal sampled	3	2

[a] Not included in sample.

Sample 8350 was cut from the face of the main entry, 2,400 feet east of the drift mouth.

Notes.—The coal was undercut by hand, and generally shot down with black powder. The three mines used the same tipple and were to connect underground in the future, eventually making one mine. The loading house was constructed of steel and was equipped with bar screens with 3-inch, 1½-inch, and ¾-inch spaces, making it possible to load four sizes of coal, including run of mine. The coal in 1909 was all loaded in run-of-mine form. It was picked on the conveyer and on the cars. The capacity of Layland No. 1 mine in 1909 was 700 tons, of No. 2 mine, 700 tons, and of No. 3, 40 tons, making a total capacity of 1,440 tons daily. The output was all to be derived from advance workings, since the mines were all new. The output was likely to be largely and rapidly increased.

For chemical analyses of this coal see part I of this bulletin, pp. 227, 228.

GENTRY. HEMLOCK MINE.

Sample.—Semibituminous to bituminous coal; New River field; analyses Nos. 5419 and 5420 (Jamestown No. 8) and analyses Nos. 8238, 8239, 8351, 8352, 8421, 8893, 8894 (p. 229).

Mine.—Hemlock; a drift mine in the Kanawha-New River district, ½ mile north of Gentry, on the Chesapeake & Ohio Railway.

Coal bed.—Known as the Fire Creek, and corresponds to the Quinnimont of the West Virginia Geological Survey. Carboniferous age, Quinnimont formation. At this mine the bed lies nearly flat and has an average thickness of 3 feet 11 inches. Roof, hard, gray shale, or slate, 6 feet thick, capped with strongly bedded sandstone; floor, shale or gray, shaly underclay (fairly hard and smooth).

The bed was measured and sampled at two points in the mine by K. M. Way on September 28, 1907, as shown below:

Sections of coal bed in Hemlock mine, ½ mile north of Gentry.

Section	A.		B.	
Laboratory No	5419		5420	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Soft coal	0	8½	1	0
Mother coal	0	¼	0	⅛
Soft coal	0	5½	..	..
Coal	1	7¾	0	1½
Mother coal	0	¼	0	⅛
Coal	0	5½	1	6½
Mother coal	..	..	0	¼
Mother coal and sulphur	0	⅜	..	..
Coal	0	7½	1	1½
Floor, shale.				
Thickness of bed	3	11⅝	3	10
Thickness of coal sampled	3	11⅝	3	10

Section A (sample 5419) was measured in the face of left entry 4, off drift 1, 1,600 feet northeast of the mine mouth.

Section B (sample 5420) was measured in the face of right entry 2, off drift 4, 900 feet east of the drift mouth.

The bed was also measured and sampled at two points by J. J. Rutledge, and at two points by J. W. Groves on July 14, 1909, and at two points by A. J. Hazlewood on August 10, 1909, as described below:

Sections of coal bed in Hemlock mine, ½ mile north of Gentry.

Section	A.		B.		C.		D.		E.		F.	
Laboratory No	8238		8239		8351		8352		8893		8894	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard gray shale.												
Coal	3	4	3	3	4	½	1	1½	2	7¼	2	10
Mother coal	0	1½	0	¼	0	½	0	¼	0	¼	0	¼
Coal	0	4	0	5½	0	5	2	2	0	5	0	5
Mother coal	..	..	..	..	..	..	0	½	0	½	0	2
Coal	..	..	..	..	..	..	0	7½	0	4	0	5¼
Coal (mother-coal streaks)	..	..	..	..	..	..	..	..	0	4	..	..
Floor, gray shaly underclay, fairly hard.												
Thickness of bed	3	9½	3	8¾	4	6	3	11¾	3	9	3	10½
Thickness of coal sampled	3	9½	3	8¾	4	6	3	11¾	3	9	3	10½

Section A (sample 8238) was cut from face of main heading, near left entry 11.

Section B (sample 8239) was cut from neck of room 5, off left entry 6, about 2,500 feet northwest of drift mouth.

Section C (sample 8351) was cut from a point about 1,800 feet east of drift mouth.

Section D (sample 8352) was cut from a point about 2,000 feet north of drift mouth.

Section E (sample 8893) was cut from room 5, off left entry 6, about 2,500 feet northwest of drift mouth.

Section F (sample 8894) was cut from room 1, off entry 12, about 3,600 feet northeast of drift mouth.

A composite sample was made by mixing samples 8351, 8352, and 8238 for an ultimate analysis, the results of which are shown under laboratory No. 8421.

Note.—The coal was undercut in the bed and was shot down with black powder. The tipple was equipped with bar screens with 1½-inch and ¾-inch openings. The coal was picked on the car by about four trimmers. The reported daily output in 1909 was about 1,000 tons, and 1,300 tons was the capacity of the mine. The future output was to be derived largely from pillars.

For results of briquetting tests of this coal, see U. S. Geol. Survey Bull. 385, p. 23.

For chemical analyses see part I of this bulletin, p. 228; also U. S. Geol. Survey Bull. 362, p. 16.

GLENDALE. GLENDALE MINE.

Sample.—Bituminous coal; New River field; analyses Nos. 8176, 8200, 8410 (p. 229).

Mine.—Glendale; Kanawha-New River district; a drift mine, at Glendale, on the Laurel Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. The thickness of this coal ranges from 3 feet 10 inches to 4 feet 4 inches. The roof is a hard, smooth, black shale. The floor is a hard underclay which has a smooth surface. The conditions were favorable for loading clean coal.

The bed was measured and sampled in two places by J. W. Groves on July 9, 1909, as shown below:

Sections of coal bed in Glendale mine at Glendale.

Section	A		B	
Laboratory No.	8176		8200	
	Ft.	*in.*	*Ft.*	*in.*
Roof, black shale.				
Coal	3	5	4	0
Mother coal	0	1	..	..
Coal	0	7½	..	..
Floor, hard, smooth underclay.				
Thickness of bed	4	1½	4	0
Thickness of coal sampled	4	1½	4	0

Section A (sample 8176) was cut from room 1 on right entry 1, off daylight entry, 800 feet north of drift mouth.

Section B (sample 8200) was cut from room 2, Beck Burt entry, 1,400 feet north of drift mouth.

A composite sample was made by mixing samples 8176 and 8200. The results of an ultimate analysis of this sample are shown under laboratory number 8410.

Notes.—The coal at this mine was undercut with picks and shot down with powder. The entire work was in pillars, so very little shooting was required. Run-of-mine coal only was loaded. The mine in July, 1909, had a capacity of 350 tons, and the daily average output was 250 tons.

For chemical analyses of this coal see part I of this bulletin, p. 229.

GLEN JEAN. COLLINS MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7922, 7923, 8124, 8125, 8192, 8650, 8651 (p. 229).

Mine.—Collins; Kanawha-New River district; a drift mine; ½ mile from Glen Jean, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness of the coal ranges from 4¼ to 5¼ feet. The roof is a hard shale. The floor is a soft shaly underclay.

The bed was measured and sampled at four points by F. J. Simington on July 9, 1909, and at two points by A. J. Hazlewood on August 4, 1909, as described below:

Sections of coal bed in the Collins mine, ½ mile from Glen Jean.

Section	A		B		C		D		E		F	
Laboratory No.	7923		7922		8124		8125		8650		8651	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*F.*	*in.*
Roof, hard shale.												
Coal and sulphur	..	..	..	..	0	3½	0	2	..	..	..	..
Coal	2	1	1	2¾	2	1⅜	1	3¼	1	9¼	2	2½
Sulphur coal	..	..	..	..	..	..	..	..	0	¼	..	..
Coal (gray splint)	..	..	0	7	..	..	..	..	..	..	1	1½
Coal	..	..	0	4⅜	..	..	..	..	0	4	1	5
Mother coal streak	..	..	..	¼	..	..	..	..	..	..	..	..
Bony coal[a]	..	..	..	..	..	..	..	..	..	..	0	6
Coal (gray splint)	0	5¾	0	8⅞	0	1¾	0	1⅝	1	4	..	..
Mother coal streak	..	..	..	¼	..	..	..	..	..	..	..	..
Coal, hard	..	..	..	..	..	..	..	..	..	..	0	5½
Coal, soft	..	..	..	..	..	..	..	..	1	7½	..	..
Coal	1	10¼	2	11	2	8¼	2	1⅞	..	..	..	..
Floor, soft shaly underclay.												
Thickness of bed	4	5	5	10½	5	2⅞	3	8¾	5	1	5	8½
Thickness of coal sampled	4	5	5	10½	5	2⅞	3	8¾	5	1	5	2½

[a] Not included in sample.

Section A (sample 7923) was cut from room 14, off left entry 12, 7,000 feet north of drift mouth.

Section B (sample 7922) was cut from room 2, off right entry 5, off main entry 21, 7,000 feet from drift mouth.

Section C (sample 8124) was cut from pillar 18, off right entry 9, off main entry 1, 3,300 feet south of drift mouth.

Section D (sample 8125) was cut from room 2, off left entry 2, off entry 21, 4,000 feet southeast of drift mouth.

Section E (sample 8650) was cut from face of right entry 6, off entry 21, 4,800 feet southeast of drift mouth.

Section F (sample 8651) was cut from near face of left entry 9, off entry 21, 4,000 feet east of drift mouth.

A composite sample was made by mixing samples 7922, 7923, 8124, and 8125, for an ultimate analysis, the results of which are shown under laboratory number 8192.

Notes.—The coal at this mine was undercut in the lower part of the bed by chain machines. The tipple was equipped with screens to give three sizes of coal: Lump, over 5-inch screen; egg, over 2-inch, and slack through 2-inch. The screenings were coked, the plant having 90 ovens. The average daily output in July, 1909, was 1,100 tons.

For chemical analyses of this coal, see part I of this bulletin, pp. 229, 230.

GLEN JEAN. NICHOL MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8000, 8004, 8022, 8595, 8596, 8110 (p. 230).

Mine.—Nichol; Kanawha-New River district; a slope mine, 30 feet in depth at Glen Jean, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from about 4½ feet to 5½ feet; roof, sandstone, underlain for the most part with hard blue shale; floor, hard blue shaly underclay.

The bed was measured and sampled at three points on June 21–24, 1909, by H. M. Wolflin, and at two points on July 31, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Nichol mine at Glen Jean.

Section	A		B		C		D		E	
Laboratory No	8000		8004		8022		8595		8596	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone or hard blue shale.										
Hard coal (in places sulphurous)	0	10½	1	¼	0	7½	..	..	..	..
Very soft coal	0	10	0	5¼	..	5¼	1	7	1	6
Bright coal	0	11¾	1	0	..	..	..	..	..	..
Bone [a]	..	..	..	..	0	2	..	..	..	..
Bony coal	..	..	..	..	0	1¼	..	..	..	..
Coal	..	..	..	..	1	2¼	..	..	..	..
Hard gray coal	0	1¼	0	1¼	1	1½	0	10	1	0
Coal	2	¾	1	11¼	..	..	2	½	2	2
Mother coal	..	..	0	1	..	..	..	..	..	..
Hard bony coal	0	1	..	..	..	..	..	..	..	..
Coal (in places mother-coal streaks)	0	5½	0	4¼	1	2¾	..	..	..	..
Floor, hard shaly underclay.										
Thickness of bed	5	4¾	4	11¼	4	10½	4	5½	4	8
Thickness of coal sampled	5	4¾	4	11¼	4	8½	4	5½	4	8

[a] Not included in sample.

Section A (sample 8000) was cut from face of left entry 4, about 2,800 feet northwest of slope.

Section B (sample 8004) was cut from face of right entry 3, about 2,300 feet north of slope.

Section C (sample 8022) was cut from face of main entry, about 2,750 feet approximately northwest of slope.

Section D (sample 8595) was cut from face of left entry 5, about 2,500 feet from slope.

Section E (sample 8596) was cut from face of right entry 5, about 2,500 feet from slope.

A composite sample was made by mixing samples 8000, 8004, and 8022 for an ultimate analysis, the results of which are shown under laboratory number 8110.

Notes.—The coal was undercut in the bed with chain machines and by hand, and was shot down with a short-flame explosive. The tipple contained bar screens with 1½-inch and 5-inch openings. The coal was picked on the car. The daily output averaged about 600 tons, and 900 tons was the capacity of the mine. The future output for some time to come was to be derived mainly from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 230.

HARVEY. HARVEY MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7920, 7921, 8085, 8164 (pp. 230, 231).

Mine.—Harvey; Kanawha-New River district; a drift mine at Harvey, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from 3 feet 10 inches to 5 feet 1 inch; roof, sandstone, between which and the coal there is sometimes a shale; floor, soft shaly underclay.

The bed was measured and sampled at two points on June 10, 1909, and at one point on June 30, 1909, by F. J. Simington, as described below.

Sections of coal in bed in Harvey mine at Harvey.

Section	A		B		C	
Laboratory No	7920		7921		8085	
Roof, sandstone or shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (in some places sulphur and mother-coal streaks)	1	7½	1	5¾	1	2½
Bony coal	..	..	..	..	0	2¼
Coal	..	..	..	..	0	6¼
Hard gray coal	1	1	0	11¾	0	3
Coal (in some places mother-coal streaks)	1	4¾	0	6½	..	..
Mother coal	..	..	0	½	..	..
Coal	..	..	0	10½	2	10
Floor, soft shale.						
Thickness of bed	4	1¼	3	11	5	0
Thickness of coal sampled	4	1¼	3	11	5	0

Section A (sample 7920) was cut from room 14 off right entry 19 in No. 1 district, about 9,000 feet northeast of drift mouth.

Section B (sample 7921) was cut from room 1 off right entry 10 in No. 2 district, about 7,000 feet north of drift mouth.

Section C (sample 8085) was cut from room 17 at face of right entry 1, off left entry 4, 8,000 feet south of drift mouth.

A composite sample was made by mixing samples 7920, 7921, and 8085 for an ultimate analysis, the results of which are shown under laboratory number 8164.

Notes.—The coal at this mine was undercut by hand and with chain machines, and was shot down with black powder. The tipple was equipped with bar screens with 5-inch and 1¾-inch openings. The daily output at the time of sampling averaged about 650 tons, 1,000 tons being the capacity of the mine.

For chemical analyses of this coal see part I of this bulletin, pp. 230, 231.

HAWKS NEST. MILL CREEK MINE.

Sample.—Semibituminous (?) coal; New River field; analyses Nos. 8178, 8179, 8288 (p. 231).

Mine.—Mill Creek; Kanawha-New River district; a drift mine 1 mile east of Hawks Nest, on the Ansted Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The coal at this mine averages 2 feet 10 inches in thickness, and has no partings to be thrown out. The roof is a strong, solid bony coal which parts freely from the coal; the floor is a hard shaly underclay. The total cover over the coal at the mine is from 30 to 350 feet.

The bed was measured and sampled at two points by G. S. Rice on July 12, 1909, as described below:

Sections of coal bed in Mill Creek mine, 1 mile east of Hawks Nest.

Sections	A		B	
Laboratory No.	8179		8178	
Roof, bony coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal (gray)	0	8	0	9½
Coal (dull gray) (sometimes called "splint")	0	3	0	1½
Coal (bright)	0	4	1	7½
Mother coal	0	½	..	..
Coal (bright, clean)	1	½	..	..
Floor, hard shaly underclay.				
Thickness of bed	2	4	2	6½
Thickness of coal sampled	2	4	2	6½

Section A (sample 8179) was cut from the face of room 6, 50 feet from left entry 1, 1,000 feet west of the mouth of the mine. The sample was wet and the coal face was dripping moisture.

Section B (sample 8178) was cut from the face in crosscut at head of the main entry, 1,400 feet southeast of the mouth of the mine (sample damp).

A composite sample was made by mixing samples 8178 and 8179 for an ultimate analysis, the results of which are shown under laboratory No. 8288.

Notes.—The coal at this mine was undercut with air punching machines and shot down with a permissible explosive. The tipple had round-bar screens with 3¼-inch spaces. The coal was picked as it was loaded on the railroad cars. The capacity of the mine was 200 tons, the actual average output being 150 tons per day, the greater part of which was sold as run-of-mine coal. The mine was a new one and had a large acreage ahead.

For chemical analyses of this coal see part I of this bulletin, p. 231.

HERBERTON. HERBERTON MINE.

Sample.—Bituminous coal; Kanawha field; analyses Nos. 8903, 8904, 8905, 8937 (p. 231).

Mine.—Herberton; Kanawha-New River district; a drift mine at Herberton, on the Virginian Railway.

Coal bed.—Known in this field as the Eagle or No. 1 Gas. Carboniferous age, Kanawha formation. The coal varies in thickness from 4 to 5 feet, and has a sandstone roof over a part of the mine and shale over the other parts. The floor varies from a sandy shale to a hard underclay.

The bed was measured and sampled at three points by A. J. Hazelwood on August 16, 1909, as described below:

Sections of coal bed in Herberton mine at Herberton.

Section	A		B		C	
Laboratory No	8903		8904		8905	
Roof, sandstone or shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal [a]	..	..	0	1	..	..
Mother coal (hard) [a]	..	..	0	¼	..	..
Coal (fragile)	1	8¼	1	7½	1	10
Clay (blue) [a]	..	..	0	1½	..	..
Coal (gray splint)	0	10	1	2	0	8
Coal (fragile)	1	5¼	0	10	1	7
Floor, sandy shale or underclay.						
Thickness of bed	3	11½	3	10¼	4	1
Thickness of coal sampled	3	11½	3	7½	4	1

[a] Not included in sample.

Section A (sample 8903) was cut from pillar No. 1 on right entry 1, 400 feet north of drift mouth.

Section B (sample 8904) was cut from the face of the main entry, 1,500 feet northwest of the drift mouth.

Section C (sample 8905) was cut from the face of room 21, off left entry 1, 1,200 feet west of the drift mouth.

A composite sample was made by mixing samples 8903, 8904, and 8905. The results of an ultimate analysis of this sample are shown under laboratory No. 8937.

Notes.—The coal at this mine was undercut with hand picks; two-thirds was shot down with a short-flame explosive and one-third with black powder. There were no screens, the entire output being loaded as run-of-mine coal. The coal was cleaned by one picker as it was loaded on the car. The rated capacity of the mine in 1909 was 630 tons per day, the average daily output being 400 tons and the maximum day's run 650 tons. The output of the mine was to be gradually increased, the coal to be derived from advance work. This mine had 1,700 acres of unmined coal.

For chemical analyses of this coal see part I of this bulletin, p. 231.

KILSYTH. KILSYTH MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8058, 8089, 8090, 8091, 8095, 8163 (p. 231).

Mine.—Kilsyth; Kanawha-New River district; a drift mine at Kilsyth, on the Kanawha, Glen Jean & Eastern Railway connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, not very uniform, ranging as mined from 4 feet 6 inches to 6 feet 4 inches; roof, generally a hard, blue, clay shale, sometimes cut out by sandstone; between this main roof and coal there is a draw slate 2 inches to 6 inches thick, which falls with the coal; floor, hard, shaly clay, with smooth surface.

The bed was measured and sampled by H. M. Wölflin at one point on June 29, 1909: at three points on July 1, 1909, and at one point on July 3, 1909, as described below,

Sections of coal bed in Kilsyth mine, at Kilsyth.

Section	A		B		C		D		E	
Laboratory No	8058		8090		8095		8091		8089	
Roof, sandstone or hard blue shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal, with streaks of sulphur or bone in some places	1	4	1	3¾	0	9	1	1	0	8¼
Hard shaly clay (miner's slate)[a]	0	2	0	2¼	0	1½	..	..	0	5¾
Bright coal	1	10¾	0	5	1	8½	1	5¾	0	7
Bone [a]	..	..	0	2	..	..	..	..	0	6
Bright coal	..	..	1	4½	..	..	..	..	0	4
Hard gray coal	0	1	0	5½	0	7½	0	5	1	1
Bright coal (mother-coal streaks)	..	..	1	10	..	..	..	..	2	1½
Hard shaly clay (miner's slate)[a]	..	..	0	2	..	..	..	..	0	2
Bright coal (mother-coal streaks)	2	2	0	6	1	3¾	2	2⅛	0	5
Floor, hard blue shaly underclay.										
Thickness of bed	5	7¾	6	5	4	6¼	5	1⅞	6	4½
Thickness of coal sampled	5	5¾	5	10¾	4	4¾	5	1⅞	5	2¾

[a] Not included in sample.

Section A (sample 8058) was cut from room 7 on right entry 13, about 3,000 feet south of west of drift mouth.

Section B (sample 8090) was cut from face of main entry 2, about 5,000 feet approximately southeast of drift mouth.

Section C (sample 8095) was cut from face of left entry 14, about 4,500 feet approximately southeast of drift mouth.

Section D (sample 8091) was cut from face of left entry 12, about 5,500 feet approximately southeast of drift mouth.

Section E (sample 8089) was cut from room 11 on dip 1, about 4,500 feet approximately southwest of drift mouth.

A composite sample was made by mixing samples 8058, 8089, 8090, 8091, and 8095, the results of which are shown under laboratory No. 8163.

Notes.—The coal from this mine, like that from many others in the field, is for the most part soft and friable. It was undercut almost entirely by hand, there being only one mining machine at the mine. It was shot down with a permissible explosive. The tipple had bar screens with 1-inch, 2-inch, and 3-inch openings. The estimated daily output at the time of sampling was about 2,000 tons; about 2,600 tons was the capacity of the mine. The immediate future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 231.

LAUREL CREEK. LAUREL MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8073, 8074, 8075, 8119, 8892 (pp. 231, 232).

Mine.—Laurel; Kanawha-New River district; a drift mine at Laurel Creek, on the Laurel Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, nearly uniform, ranging as mined from about 3 feet 4 inches to 4 feet 6 inches; roof, hard, blue slate, between which and the coal there is sometimes a draw slate; floor, hard, smooth, shaly underclay.

The bed was measured and sampled at three points on July 5, 1909, by C. A. Fisher, and later at one point by A. J. Hazlewood, as shown below:

Sections of coal bed in Laurel mine at Laurel.

Section	A		B		C		D	
Laboratory No	8073		8074		8075		8892	
Roof, hard, blue shale, or draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (in some places mother-coal streaks)	0	6	..	..	0	6	1	2
Hard gray coal	..	..	..	..	..	..	0	3
Bone [a]	0	½	..	..	0	2	..	..
Coal	3	2½	3	9½	3	3	2	3½
Floor, hard, smooth, shaly underclay.								
Thickness of bed	3	9	3	9½	3	11	3	8½
Thickness of coal sampled	3	9	3	9½	3	9	3	8½

[a] Not included in sample.

Section A (sample 8073) was cut from left straight heading 1.

Section B (sample 8074) was cut from left heading 7.

Section C (sample 8075) was cut from right heading 12.

Section D (sample 8892) was cut from face of left heading 1, off main heading 12, about 4,000 feet northeast of opening.

A composite sample has been made by mixing samples 8073, 8074, and 8075. The results of an ultimate analysis of this sample are shown under laboratory No. 8119.

Notes.—The coal was mined by hand in the top coal. The tipple was not equipped with screens, so that the entire output of the mine was shipped as run-of-mine coal. The daily output at the time of sampling averaged about 400 tons, and 500 tons was a maximum day's run. There was approximately 2,900 acres of coal to be taken out from the opening.

For chemical analyses of this coal see part I of this bulletin, pp. 231, 232.

LAWTON. GREENWOOD (SLATER HOLLOW) MINE.

Sample.—Semibituminous coal, New River field; analyses Nos. 8168, 8198, 8407, 8177, 8212, 8408 (p. 232).

Mine.—Greenwood (Slater Hollow); Kanawha-New River district; a drift mine, located in the New River field, West Virginia, at Lawton, on the Laurel Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, very uniform, ranging as mined from about 3¾ feet to 4¼ feet; roof, strong, dark shale; floor, hard, gray shaly underclay.

The bed was measured and sampled at two points on July 10, 1909, by J. W. Groves, and at two points July 10, 1909, by J. J. Rutledge, as described below:

Sections of coal bed in Greenwood (Slater Hollow) mine at Lawton.

Section	A		B		C		D	
Laboratory No	8168		8198		8177		8212	
Roof, dark shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	..	..	..	..	..	..	0	1¼
Coal	4	2	3	10½	1	4½	3	0
Hard gray coal	..	..	..	..	0	2	..	..
Mother coal	..	..	..	..	..	..	1	¾
Coal	..	..	..	..	2	4	..	1¼
Floor, hard shaly underclay.								
Thickness of bed	4	2	3	10½	3	10½	4	3¼
Thickness of coal sampled	4	2	3	10½	3	10½	4	3¼

Section A (sample 8168) was cut from last breakthrough in Valentine entry, about 1,100 feet south of drift mouth.

Section B (sample 8198) was cut from neck of room 6 on right entry 2, off Valentine entry.

Section C (sample 8177) was cut from right entry 2, off entry 7, about 3,600 feet northwest of drift mouth.

Section D (sample 8212) was cut from Moss's entry, about 5,700 feet northwest of drift mouth.

Two composite samples were made: (1) by mixing samples Nos. 8168 and 8198 for an ultimate analysis, the results of which are shown under laboratory No. 8407; (2) by mixing samples 8212 and 8177 for an ultimate analysis, the results of which are shown under laboratory No. 8408.

Notes.—The coal was undercut in the bed and was shot down with black blasting powder. The bin was equipped with bar screens 12 feet long with 1½-inch and ¾-inch openings. The screens in July, 1909, were not in use, the entire output being shipped as run-of-mine coal. The coal was picked on the car by four trimmers. The daily output in July 1909 averaged about 150 tons, and 300 tons was the capacity of the mine. The future output for sometime to come was to be derived almost entirely from pillar work. The mine operator had about 3,500 acres practically untouched.

For chemical analyses of this coal see part I of this bulletin, p. 232.

LAWTON. QUINNIMONT (LICK BRANCH) MINE.

Sample.—Semibituminous coal, New River field; analyses Nos. 8197, 8214, 8215, 8299 (p. 232).

Mine.—Quinnimont (or Lick Branch); Kanawha-New River district; a drift mine, ¼ mile from Lawton, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, nearly uniform, ranging as mined from about 3 feet 8 inches to 4 feet 3 inches; roof, strong, dark shale; floor, dark, hard shale.

The bed was measured and sampled by J. J. Rutledge on July 9, 1909, at three points, as described below:

Sections of coal bed in Quinnimont (Lick Branch) mine, ¼ mile from Lawton.

Section	A		B		C	
Laboratory No	8197		8214		8215	
Roof, dark shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	1	0	6	0	2¾
Dark shale (in some places sulphurous)[a]	0	½	0	½	0	¼
Coal	3	7½	3	2¾	3	10¼
Floor, dark shale.						
Thickness of bed	3	9	3	9¼	4	1¼
Thickness of coal sampled	3	8½	3	8¾	4	1

[a] Not included in sample.

Section A (sample 8197) was cut from left entry 1, off right entry 2, about 900 feet north of drift mouth.

Section B (sample 8214) was cut from breakthrough between right entry 2 and air-course, about 3,000 feet northeast of drift mouth.

Section C (sample 8215) was cut from breakthrough between right entry 2 and air-course, 2,000 feet northwest of drift mouth.

A composite sample was made by mixing samples 8197, 8214, and 8215, for an ultimate analysis, the results of which are shown under laboratory No. 8299.

Notes.—The coal was mined by hand and was shot down with black powder. The entire output was shipped as run-of-mine coal. The daily output in July, 1909, averaged about 300 tons and that was also the capacity of the mine with its equipment at that time. The future output was to be derived from both advance work and from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 232.

LOOKOUT. BLUME MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8149, 8150, 8156, 8609, 8194 (p. 233).

Mine.—Blume; Kanawha-New River district; a drift mine at Lookout, 8 miles east of Nuttall, on the Keeneys Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 3 to 4 feet; roof, strong, gray, fine-grained shale, 18 feet thick, with a cap rock above; floor, hard clay.

The bed was measured and sampled at three points by R. Y. Williams on July 7, 1909, and at one point by A. J. Hazlewood on July 26, 1909, as described below:

Sections of coal bed in Blume mine at Lookout.

Sections	A		B		C		D	
Laboratory No	8149		8150		8156		8609	
Roof, strong gray fine-grained shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft, bright, soft-grained coal	1	¼	..	..	1	1	0	11½
Medium hard bright short-grained coal	..	..	0	11¾	..	..	..	..
Hard gray dense coal	0	2¾	0	1¾	0	2	0	1½
Soft bright coal	..	..	..	..	..	8	..	..
Soft bright coal (mother-coal streaks)	2	½	1	8⅝	1	2	2	½
Floor, hard clay, smooth surface.								
Thickness of bed	3	3½	2	10⅛	3	1	3	1½
Thickness of coal sampled	3	3½	2	10⅛	3	1	3	1½

Section A (sample 8149) was cut from the face of right entry 10, 4,000 feet from drift mouth.

Section B (sample 8150) was cut from the face of main straight entry, 4,500 feet from entry.

Section C (sample 8156) was cut from the face of right entry 1, off left entry 4, 1,500 feet from drift mouth.

Section D (sample 8609) was cut from the face of right entry 1, off left entry 4, 1,500 feet from drift mouth.

A composite sample was made by mixing samples 8149 and 8150 for an ultimate analysis, the results of which are shown under laboratory No. 8194.

Notes.—The coal was undercut by chain machines in the bottom part of bed, and was shot down with permissible explosives and black powder. There were no screens; therefore the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on car. The daily output in July, 1909, averaged 500 tons, and 650 tons was a maximum day's run. The future output for some time to come was to be derived almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 233.

LOOKOUT. LOOKOUT MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8135, 8136, 8189 (p. 233).

Mine.—Lookout; Kanawha-New River district; a drift mine at Lookout, on the Keeneys Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 3 to 4 feet; roof, strong, coarse-grained, gray shale with a cap rock 5 to 18 feet above; the roof seldom falls with the coal; floor, hard clay with smooth surface, underlain with slate; cover, for the most part, 100 to 200 feet thick.

The bed was measured and sampled at two points by A. C. Ramsay on July 6, 1909, as described below:

Sections of coal bed in Lookout mine at Lookout.

Section	A		B	
Laboratory No	8135		8136	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	8½	1	0
Soft bright coal with mother-coal streaks	0	6½	0	2½
Hard gray coal	0	3	0	2
Soft bright coal with mother-coal streaks	1	3	1	4¼
Soft bright coal	0	1	..	..
Floor, hard clay.				
Thickness of bed	2	10	2	8¾
Thickness of coal sampled	2	10	2	8¾

Section A (sample 8135) was collected from the face of left entry 1, 600 feet from drift mouth.

Section B (sample 8136) was collected from the face of left entry 2, off the straight entry, 1,300 feet from drift mouth.

A composite sample was made by mixing samples 8135 and 8136 for an ultimate analysis, the results of which are shown under laboratory No. 8189.

Notes.—The coal was undercut in bottom part of bed with a chain machine, and was shot down with a permissible explosive and black powder. The tipple was not equipped with screens, so that the entire output was shipped as run-of-mine coal. The coal was picked on car. This is coking coal, but there were no ovens at this plant. The average daily output was estimated as 130 tons, and 175 tons was the maximum day's run. The future output for some years to come was to be derived from advance work only.

For chemical analyses of this coal see part I of this bulletin, p. 233.

MACDONALD. MACDONALD MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 2359 and 2360 (West Virginia No. 19) and analyses Nos. 7987, 7993, 7999, 8112 (p. 233).

Mine.—Macdonald; a drift mine in the Kanawha-New River district, at Macdonald, on the Chesapeake & Ohio Railway.

Coal bed.—Known as the Sewell of the West Virginia Geological Survey. Carboniferous age, Sewell formation. The dip of the bed varies greatly, in places being as much as 12 feet in 100, the average being about 2 feet in 100. Thickness of coal, as mined, from about 5 feet to 5 feet 6 inches; roof, gray shale, usually strong, but occasionally weak and "slippy;" floor, hard, gray shaly underclay; cover, for the most part, more than 75 feet thick.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on October 24, 1905, as shown below:

Sections of coal bed in Macdonald mine at Macdonald.

Section	A		B	
Laboratory No	2359		2360	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9	..	..
Bony coal [a]	..	..	0	6
Coal	3	4	2	1
Mother coal	0	¾	..	..
Hard coal	..	..	0	½
Coal	0	11	0	9
Mother coal	..	..	0	⅛
Coal	..	..	0	10
Shale	..	..	0	⅛
Coal	..	..	0	7
Bony coal [a]	..	..	0	1½
Coal	..	..	0	5
Floor, shale.				
Thickness of bed	5	¾	5	4¼
Thickness of coal sampled	5	¾	4	8¾

[a] Not included in sample.

Section A (sample 2359) was measured in room 11, on left entry 18, 7,720 feet in the mine opening.

Section B (sample 2360) was measured in room 16, on right entry 16, 7,600 feet southwest of the mine opening.

The bed was also measured and sampled at three points on June 16, 1909, by David White, G. S. Rice, G. S. Pope, J. J. Rutledge, F. J. Simington, and H. M. Wolflin, as described below:

Sections of coal bed in Macdonald mine at Macdonald.

Section	A		B		C	
Laboratory No	7987		7993		7999	
Roof, strong gray shale or "slippy draw-slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone and sulphurous coal [a]	..	..	0	¾	0	¾
Coal (mother-coal streaks)	2	4½	2	5½	3	¼
Hard gray coal	0	7¾	0	2	0	5¼
Coal (mother coal streaks)	1	8	2	1	2	2¾
Floor, hard gray, shaly underclay.						
Thickness of bed	4	8¼	4	9¼	5	9
Thickness of coal sampled	4	8¼	4	8½	5	8¼

[a] Not included in sample.

Section A (sample 7987) was cut from left entry 19, about 7,000 feet west of drift mouth.

Section B (sample 7993) was cut from cross entry 17, off left entry 18, about 6,000 feet southeast of drift mouth.

Section C (sample 7999) was cut from chain pillar opposite room 16, off right entry 11, about 4,200 feet southwest of drift mouth.

A composite sample was made by mixing samples 7987, 7993, and 7999. The results of an ultimate analysis of this sample are shown under laboratory No. 8112.

Notes.—The coal at this mine was undercut in the bed, usually by hand. The tipple was equipped with bar screens for lump and revolving screens 16 feet by 4 feet with ½-inch and ¾-inch openings. The slack was coked in beehive ovens, of which in June, 1909, 110 were fired and 290 idle. The coal was picked on the car. The daily output at the time of sampling in 1909 averaged about 425 tons; 600 tons was a maximum day's run. Almost the entire output in the near future was to come from pillar work.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 216; Bureau of Mines Bull. 23, pp. 69, 187; coking tests: U. S. Geol. Survey Bull. 290, p. 217; Bull. 336, pp. 26, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses see part I of this bulletin, p. 233; also U. S. Geol. Survey Bull. 290, p. 216.

MACDONALD. SUGAR CREEK MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7986, 7996, 7997, 8598, 8105 (pp. 233, 234).

Mine.—Sugar Creek; Kanawha-New River district; a drift mine 1 mile west of Macdonald, on the Loup Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, uniform, ranging as mined from 5 feet to 5 feet 6 inches; roof, strong gray shale; floor, hard gray shaly underclay.

The bed was measured and sampled at three points by J. J. Rutledge and F. J. Simington on June 18, 1909, and at one point by A. J. Hazlewood on August 2, 1909, as described below:

Sections of coal bed in Sugar Creek mine, 1 mile west of Macdonald.

Section	A		B		C		D	
Laboratory No	7986		7996		7997		8598	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal and bone	..	..	[a]0	1	0	2	..	..
Coal (in some places mother-coal streaks)	0	8	2	3¼	1	3¼	1	8
Hard gray coal	0	2¼	0	5¼	..	..	1	7
Bone	..	..	..	..	[a]0	7	..	..
Coal (in some places mother-coal streaks)	3	10¼	2	½	3	3¼	1	6½
Floor, hard, smooth, gray, shaly underclay.								
Thickness of bed	4	8½	4	10	5	3½	4	9½
Thickness of coal sampled	4	8½	4	9	4	8½	4	9½

[a] Not included in sample.

Section A (sample 7986) was cut from room 4 on air course, about 2,200 feet west of drift mouth.

Section B (sample 7996) was cut from face of entry 3, about 1,000 feet east of drift mouth.

Section C (sample 7997) was cut from room 32, off left entry 4, about 2,400 feet west of drift mouth.

Section D (sample 8598) was cut from face of room 14, off left entry 1, about 300 feet south of drift mouth.

A composite sample was made by mixing samples 7986, 7996, and 7997 for an ultimate analysis, the results of which are shown under laboratory No. 8105.

Notes.—The coal at this mine was undercut in the bed, generally by hand, and was shot down with black powder. The tipple was equipped with bar screens 12 feet long, with 1¼-inch openings, and with revolving screens 12 feet long, with ½-inch openings. The coal was picked on the car by four trimmers. The daily output at time of sampling in 1909 averaged 500 tons, and 600 tons was the capacity of the mine. Seventy-five per cent of the future output was expected to come from pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 233, 234.

MINDEN. MINDEN NO. 2 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8024, 8025, 8026, 8881, 8882, 8107 (p. 234).

Mine.—Minden No. 2; Kanawha-New River district; a drift mine at Minden, about 3 miles from Thurmond, on the Arbuckle Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, 2¾ feet to 3½ feet; roof, dark shale, between which and the coal is a 3-inch layer of draw slate; floor, hard gray underclay with rough surface.

The bed was measured and sampled at five points by J. J. Rutledge and A. J. Hazlewood on June 22, 1909, as described below:

Sections of coal bed in Minden No. 2 mine at Minden.

Section	A		B		C		D		E	
Laboratory No	8024		8025		8026		8881		8882	
Roof, dark shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8½	1	8	0	5¾	1	0	..	..
Splint coal	0	2	0	2	..	..	0	6	..	..
Sulphur coal	..	..	..	..	*a* 0	⅛	..	..	0	9
Soft sulphur with coal	..	..	..	..	..	..	..	..	0	1
Coal	2	¾	1	2	0	1½	0	6	0	2
Mother-coal streak	..	..	0	½	..	..	..	..	..	..
Sulphur coal	..	..	..	..	*a* 0	⅛	..	..	..	..
Coal	..	..	1	1	0	6	..	..	..	..
Bony coal	..	..	..	..	*a* 0	4	..	..	..	..
Coal	..	..	..	..	0	8½	..	..	..	..
Gray splint coal	..	..	..	..	0	3	0	11	2	8½
Coal	..	..	..	..	3	1½	2	0	1	4
Floor, soft underclay.										
Thickness of bed	3	11¼	4	1½	5	6½	4	11	5	½
Thickness of coal sampled	3	11¼	4	1½	5	2¼	4	11	5	½

a Not included in sample.

Section A (sample 8024) was cut from the face of left air course 9, 3,200 feet southeast of drift mouth.

Section B (sample 8025) was cut from the face of left entry 1, 3,000 feet southeast of drift mouth.

Section C (sample 8026) was cut from face of right air course 6, 2,800 feet northwest of drift mouth.

Section D (sample 8881) was cut from face of left entry 4, 2,100 feet southeast of drift mouth.

Section E (sample 8882) was cut from face of left entry 7, 1,600 feet from drift mouth.

A composite sample was made by mixing samples 8024, 8025, and 8026 for an ultimate analysis, the results of which are shown under laboratory No. 8107.

Notes.—The coal at this mine was undercut by hand and machine in the bottom part of the bed, and was shot down with black powder. The tipple was equipped with bar screens with 1½ and ¾ inch openings. The total output of the mine was screened. It was picked on the car by four trimmers. The coal is a coking coal, but no coke was being made at time of sampling in June, 1909. The daily output averaged 700 tons. The future output was to be derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 234.

MINDEN. MINDEN MINES NOS. 3 AND 4.

Sample.—Semibituminous coal; New River field; analyses Nos. 8027, 8028, 8249, 8381, 8880, 8249, 8029, 8030, 8031, 8102 (pp. 234, 235).

Mines.—Minden Nos. 3 and 4; Kanawha-New River district; drift mines at Minden, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness of the coal ranges from 3 to 3½ feet. The roof is a dark shale of good quality. The floor is a hard underclay with a smooth surface.

The bed was measured and sampled at four points in Minden No. 3 mine, and at three points in Minden No. 4 mine by J. J. Rutledge and A. J. Hazlewood on July 25, 1909, as described on the following page.

Sections of coal bed in Minden No. 3 mine at Minden.

Section	A		B		C		D	
Laboratory No.	8027		8028		8381		8880	
Roof, dark shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3¼	1	1½	2	0	1	5
Bony coal [a]	0	5½	0	10	..	..	..	..
Coal	0	4½	0	5½	..	..	..	..
Gray splint coal	0	1½	0	2½	0	1½	0	8
Coal	2	8	2	4½	2	5½	2	2
Floor, hard shaly underclay.								
Thickness of bed	4	10¾	5	0	4	7	4	3
Thickness of coal sampled	4	5¼	4	2	4	7	4	3

[a] Not included in sample.

Section A (sample 8027) was cut from face of left entry 7, 3,000 feet east of drift mouth.

Section B (sample 8028) was cut from face of right air course 8, in break-through No. 1.

Section C (sample 8381) was cut from crosscut in right heading 5, 2,400 feet west of drift mouth.

Section D (sample 8880) was cut from face of a room off left entry 4, 1,300 feet southeast of drift mouth.

A composite sample was made by mixing samples 8027 and 8028 for an ultimate analysis, the results of which are shown under laboratory No. 8249.

Sections of coal bed in Minden No. 4 mine at Minden.

Section	A		B		C	
Laboratory No	8029		8030		8031	
Roof, dark shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Poor coal [a]	0	1½	..	..	..	..
Coal	1	8¼	1	5¼	1	4
Gray splint coal	0	1¼	0	2	0	1½
Coal	2	4½	2	9	2	6
Floor, hard, gray shaly underclay.						
Thickness of bed	4	3½	4	4¼	3	11½
Thickness of bed sampled	4	2	4	4¼	3	11½

[a] Not included in sample.

Section A (sample 8029) was cut from face of left entry 4, 3,000 feet northwest of drift mouth.

Section B (sample 8030) was cut from face of room 5, off right entry 9, southeast of drift mouth.

Section C (sample 8031) was cut from the face of main heading, 5,000 feet northeast of drift mouth.

A composite sample was made by mixing samples 8029, 8030, and 8031 for an ultimate analysis, the results of which are shown under laboratory No. 8102.

Note.—The coal was undercut by hand in No. 4 mine and by machine in No. 3 mine, in the lower part of the bed, and was shot down with black powder. Both mines used the same tipple, which was equipped with screens with ¾ and 1½ inch openings. There was a bank of coke ovens below the mines, but they were not in use at time of sampling in 1909. The estimated daily output averaged 550 tons at No. 3 mine and 600 tons at No. 4 mine, while the capacities were 600 and 700 tons, respectively. The output in the immediate future was to be derived from advance work.

For chemical analyses of this coal see part I of this bulletin, pp. 234, 235.

MINDEN. MINDEN NO. 5 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8032, 8033, 8034, 8101 (p. 235).

Mine.—Minden No. 5; Kanawha-New River district; a drift mine at Minden, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness ranges from 3 to 4½ feet. The roof is either sandstone or shale of fairly good quality according to locality. The floor is a hard gray shaly underclay with a smooth surface.

The bed was measured at three points by J. J. Rutledge on June 23, 1909, as described below:

Section of coal bed in Minden No. 5 mine at Minden.

Section	A		B		C	
Laboratory No	8032		8033		8034	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone or shale.						
Coal and bone [a]	..	..	..	..	0	1½
Hard coal	..	..	..	..	..	..
Sulphur coal	..	..	..	..	..	..
Coal	1	6	1	4	1	4¼
Coal, gray splint	0	2	0	1½	0	2
Coal	2	9	1	10	2	8
Coal, very soft	..	..	..	..	..	..
Floor, hard, shaly underclay.						
Thickness of bed	4	5	3	3½	4	3¾
Thickness of coal sampled	4	5	3	3½	4	2¼

[a] Not included in sample.

Section A (sample 8032) was cut from face of left entry 6, 1,500 feet northwest of drift mouth.

Section B (sample 8033) was cut from face of right heading 7, 850 feet northeast of drift mouth.

Section C (sample 8034) was cut from face of main heading, 4,000 feet north of drift mouth.

A composite sample was made by mixing samples 8032, 8033, and 8034 for an ultimate analysis, the results of which are shown under laboratory No. 8101.

Notes.—The coal at this mine was undercut by hand and machine at the bottom of the bed, and was shot down with black powder. The tipple was equipped with 1½ and ¾ inch screens. There were no coking ovens at this mine. The estimated output in 1909 was 550 tons, but the capacity was 600 tons daily. The future output was to be derived from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 235.

PAGE. EAGLE MINE.

Sample.—Bituminous coal; Kanawha field; analysis No. 6932 (p. 235).

Mine.—Eagle; Kanawha-New River district; a drift mine 1½ miles northeast of Page, on the Virginian Railway, Deepwater Division.

Coal bed.—Eagle or No. 1 Gas. Carboniferous age, Kanawha formation. The roof and floor are shale.

The bed was measured and sampled on December 17, 1908, by G. S. Pope as described below:

Section of coal bed in Eagle mine, 1½ miles northeast of Page.

Laboratory No	6932	
	Ft.	*in.*
Roof, shale.		
Coal	0	2½
Sulphur streak	..	..
Coal	0	9½
Shale and fire clay	[a] 0	9
Coal	1	2¼
Mixtures [b]	[a] 1	0
Coal	0	4¾
Mother coal	0	¼
Coal	1	1½
Mother-coal streak	..	..
Coal	0	5½
Bony coal	0	1½
Coal	0	7¾
Floor, shale.		
Thickness of bed	6	8½
Thickness of coal sampled	4	11½

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[a] Not included in sample.

[b] Beginning at the top of this parting, the following mixtures were found: Shale and coal, 2¼ inches; shale, 1 inch; coal and shale, 4 inches; soft blue mud, ½ inch; soapstone and fire clay, 4¼ inches.

The sample was taken 800 feet from opening in room 10, off airway 8, and was wet when taken.

Notes.—No machines were used; coal was easily shot down and picked. The coal all went to 1½-inch screens; that which passed over was designated steam coal, and that which went through was used in coke ovens.

For chemical analyses of this coal see part I of this bulletin, p. 235.

PAGE. ANSTED MINE.

Sample.—Bituminous coal; Kanawha field; analysis No. 6933 (Ann Arbor No. 5) and analysis No. 5439 (p. 236).

Mine.—Ansted; Kanawha-New River district; a drift mine 2¼ miles northeast of Page, on the Virginian Railway.

Coal bed.—Ansted or No. 2 Gas. The coal is of carboniferous age, Kanawha formation.

The bed is about 9 feet thick. Roof, shale; floor, shale.

The bed was measured and sampled on October 5, 1907, by K. M. Way, as described below:

Section of coal bed in Ansted mine, 2¼ miles northeast of Page.

Laboratory No.	5439	
Roof, shale.	*Ft.*	*in.*
Coal	0	4¾
Mother coal	0	⅛
Coal	1	7¼
Mother coal	0	¼
Coal	0	8½
Hard coal	0	11
Coal	1	1
Shale [a]	0	9½
Coal	1	5¼
Mother coal	0	⅛
Coal	0	9½
Mother coal	0	¼
Coal	1	2
Floor, shale.		
Thickness of bed	8	11½
Thickness of coal sampled	8	2

[a] Not included in sample.

Sample was taken in room 16, off right entry 3, 1,100 feet northeast of opening.

The bed was also measured and sampled by G. S. Pope on December 17, 1908, as shown below:

Section of bed in Ansted mine, 2¼ miles northeast of Page.

Laboratory No.	6933	
Roof, shale and sandstone mixed.	*Ft.*	*in.*
Coal	0	2¼
Sulphur	0	⅛
Coal	0	¾
Sulphur [a]	0	¼
Coal	0	4¼
Sulphur [a]	0	½
Coal	0	8⅝
Mother coal	0	¼
Coal	1	6⅝
Splinty coal	1	5
Splinty coal	0	7½
Sulphur	0	⅛
Coal	0	⅞
Shale (parts benches) [a]	0	11
Splinty coal	1	1½
Coal	0	8⅛
Mother coal	0	¼
Coal	0	8⅞
Mother coal	0	½
Coal	0	10¼
Floor, shale.		
Thickness of bed	9	5⅝
Thickness of coal sampled	8	5⅞

[a] Not included in sample.

The sample was taken from point 1,500 feet northeast of opening in room 22, off entry 6.

Notes.—"Sulphur" occurs with irregularity but in considerable quantities, both as partings and balls; in places mixed with mother coal. The rejected parting is a persistent layer of shale varying from 6 inches to a thickness such that the lower coal was not worked. The mining bed is the top of above bench; after being picked out the coal was shot from shale. Generally the shale was picked and then the lower bench shot up. No machines. In all, there were 505 ovens; the greater part of the coal was coked. Capacity of mine was 700 tons daily.

For results of illuminating-gas tests of this coal, see Bureau of Mines Bull. 6, pp. 39, 47.

For chemical analyses see part I of this bulletin, p. 236.

PAGE. PAGE NO. 1 MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 14) analyses Nos. 1869, 1870, 2178 (p. 236).

Mine.—Page No. 1; Kanawha-New River district; a drift mine at Page, on the Deep Water Railway and the Chesapeake & Ohio Railway.

Coal bed.—Locally known as the Eagle. Carboniferous age, Kanawha formation. Its thickness is about 7 feet, and it lies nearly flat. The roof is a sandy shale. The floor is the same.

The bed was measured and sampled at one point by J. W. Groves and W. J. von Borries, on September 22, 1905, as shown below:

Section of coal bed in Page No. 1 mine at Page.

Laboratory No.	2178	
Roof, slate.	*Ft.*	*in.*
Coal	0	2
Draw slate	[a] 0	4
Coal	1	1
Shale	[a] 0	9
Coal	1	3
Coal and shale	[a] 0	2½
Coal	[a] 0	3
Shale	[a] 0	6
Coal	2	6
Floor, slate.		
Thickness of bed	7	½
Thickness of coal sampled	5	0

[a] Not included in sample.

Sample 2178 was measured in airway 8, 1,100 feet from the mine opening.

Sample 1869 was taken from the lower bench of this coal. Sample 1870 was taken from the middle bench, at a point 774 feet from the mine opening.

Notes.—The output of this mine, like that of the Page No. 2 mine, was largely made into coke, the operator having in 1905 a total of 505 ovens located near the two mines.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 205; Bureau of Mines Bull. 23, pp. 69, 186; producer-gas tests: Bureau of Mines Bull. 13, pp. 221, 276; coking tests: U. S. Geol. Survey Bull. 290, p. 206; Bull. 336, pp. 25, 34, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 57, 61, 64.

For chemical analyses see part I of this bulletin, p. 236; also U. S. Geol. Survey Bull. 290, p. 204.

PAGE. PAGE NO. 2 MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 13) analyses Nos. 1867, 1868, and 2177 (p. 236).

Mine.—Page No. 2; Kanawha-New River district; a drift mine at Page, on the Chesapeake & Ohio Railway and the Deep Water Railway.

Coal bed.—Locally known as the Ansted or No. 2 Gas. Carboniferous age, Kanawha formation. Thickness, fairly uniform, averaging 10 feet. The bed lies nearly flat.

Two mine samples (Nos. 1867 and 1868) were collected by E. W. Parker in 1905, and one sample (No. 2177) by J. W. Groves and W. J. von Borries on September 22, 1905, as shown below:

Section of coal bed in Page No. 2 mine at Page.

Laboratory No	2177
Roof, shale.	Ft. in.
Coal	1 4
Sulphur [a]	0 1½
Coal	3 7
Shale [a]	1 8
Coal	3 5
Floor, shale.	
Thickness of bed	10 1½
Thickness of coal sampled	8 4

[a] Not included in sample.

Sample 2177 was taken from entry 6, 500 feet east of the mine opening.

Sample 1867 was taken from the lower bench, from entry 5, 302 feet from the mine opening. Sample 1868 was taken from the upper bench.

Note.—The coal from this mine was largely made into coke.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 201; Bureau of Mines Bull. 23, pp. 69, 185, 186; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 202; Bureau of Mines Bull. 13, pp. 219, 276; coking tests: U. S. Geol. Survey Bull. 290, p. 336; Bull. 336, pp. 25, 34, 43, 44.

For chemical analyses see part I of this bulletin, p. 236; also U. S. Geol. Survey Bull. 290, p. 201.

PARAL. BEECH CREEK MINE.

Sample.—Bituminous coal; Kanawha field; analysis No. 8173 (p. 236).

Mine.—Beech Creek; Kanawha-New River district; a drift mine, ½ mile northwest of Paral, on the White Oak Railroad, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway and the Virginian Railway.

Coal bed.—Known in this field as the Eagle. Carboniferous age, Kanawha formation. The coal varies in thickness from 3 to 3½ feet. The immediate roof of the mine consists of two layers of shale and coal, above which is shale 4 to 6 feet in thickness, and overlying the shale is a sandstone cap rock. The floor is an underclay with smooth surface. The coal adheres closely to the roof.

The bed was measured and sampled at one point by David White on July 9, 1909, as described below:

Sections of coal bed in Beech Creek mine, ½ mile northwest of Paral.

Laboratory No	8173
Roof, shale and coal.	Ft. in.
Coal (bright)	0 6
Bony coal	0 1¼
Coal (mother-coal streaks)	0 11¼
Coal (soft)	1 7
Floor, smooth underclay.	
Thickness of bed	3 1½
Thickness of coal sampled	3 1½

Sample 8173 was cut from the face of right heading 2, 900 feet from the drift mouth.

Notes.—The coal in this mine was undercut in the bottom part of the bed with puncher machines, and was shot down with black powder. The coal was all loaded in run-of-mine form. The mine was idle when sampled in July, 1909. Reported average output 50 tons a day, the maximum day's run being 200 tons. Coal mostly sold for domestic use; hence the mine was more active in the winter months. The acreage of unmined coal was large. The near future output was to be from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 236.

POWELLTON. VULCAN MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 9) analyses Nos. 1208, 1209 (p. 237).

Mine.—Vulcan; Kanawha-New River district; 3 miles south of Powellton, on the Powellton & Pocahontas Railroad, a short line connecting with the Chesapeake & Ohio Railroad.

Coal bed.—At this mine a coal called the Powellton seam is mined; it is of Carboniferous age, Kanawha formation, and is near the geologic position of the Ansted and the Coal Valley beds, but probably at a slightly different horizon. This is a very regular bed and lies nearly horizontal. It is opened by drifts.

The bed was measured and sampled at two points by J. S. Burrows on October 6, 1904, as shown below:

Sections of coal bed in Vulcan mine, 3 miles south of Powellton.

Section	A		B	
Laboratory No.	1208		1209	
	Ft.	*in.*	*Ft.*	*in.*
Bone [a]	0	5	0	4
Coal	2	1	2	0
Shale [a]	0	6	0	4
Coal	3	5	2	5
Thickness of bed	6	5	5	1
Thickness of coal sampled	5	6	4	5

[a] Not included in sample.

Section A (sample 1209) was measured in an entry on the extreme north side of the mine.

Section B (sample 1208) was measured on the extreme south side of the mine.

Notes.—The coal was used principally for making coke. It was also used for gas making and for steam production. The rated output of the mine in 1904 was 400 to 900 tons per day. Output of mine in fiscal year 1910, 96,985 long tons.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 889; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1269; Bull. 261, p. 112; Bureau of Mines Bull. 13, pp. 217, 276; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1472; Bull. 261, p. 72; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1363; Bull. 261, p. 128.

For chemical analyses see part I of this bulletin, p. 237; also U. S. Geol. Survey Prof. Paper 48, p. 257; Bull. 261, p. 57.

PRICE HILL. SHERWOOD MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7989, 7990, 8292 (p. 237).

Mine.—Sherwood; Kanawha-New River district; a shaft mine, 119 feet in depth, at Price Hill, Fayette County, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Kanawha formation. Thickness, as mined, about 2 to 4 feet; roof, treacherous shale, between which and the coal there is often several inches of bony coal; floor, shaly underclay.

The bed was measured and sampled at two points by F. J. Simington on June 16, 1909, as described on the following page.

Sections of coal bed in Sherwood mine at Price Hill.

Section	A		B	
Laboratory No	7989		7990	
Roof, shale (poor quality).	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal[a]	..	..	0	½
Coal	0	3¾	0	7⅞
Sulphurous coal	0	7¼	0	⅛
Coal	2	6	1	10¾
Mother coal	..	..	0	¼
Coal	..	..	1	¾
Floor, shaly underclay.				
Thickness of bed	3	5	3	8¼
Thickness of coal sampled	3	5	3	7¾

[a] Not included in sample.

Section A (sample 7989) was cut from face of main west entry, about 3,500 feet southwest of shaft.

Section B (sample 7990) was cut from face of left entry 5, about 2,500 feet southwest of shaft.

A composite sample was made by mixing samples 7989 and 7990 for an ultimate analysis, the results of which are shown under laboratory No. 8292.

Note.—The coal was undercut by hand in the bed.

For chemical analyses of this coal see part I of this bulletin, p. 237.

PRUDENCE. PRUDENCE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7915, 7916, 8218, 8219, 8301 (p. 237).

Mine.—Prudence; Kanawha-New River district; at Prudence, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly even, ranging, as mined, from about 4 feet 2 inches to 5 feet 6 inches; roof, sandstone underlain for the most part with clay, which varies from soft and moist to hard, dry, and shaly; floor, shale with smooth surface, which in places softened and became mixed with the coal in loading; cover, for the most part, probably less than 100 feet thick.

The bed was measured and sampled at two points by F. J. Simington on June 9, 1909, and at two points by H. M. Wolflin on July 12, 1909, as described below:

Sections of coal bed in Prudence mine at Prudence.

Section	A		B		C		D	
Laboratory No	7915		7916		8218		8219	
Roof, clay.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal	0	2	0	9	0	9	0	6⅞
Mother coal	..	..	..	..	0	¼	0	⅛
Soft coal	..	..	..	..	0	8	0	8½
Bony coal	0	¼	..	..	..	..	1	1
Bright coal	0	11	..	..	..	..	..	..
Hard gray coal	0	11	2	⅞	0	5	0	2½
Bony coal	1	6½	..	..	..	..	..	..
Bright coal	0	1	..	..	..	..	..	..
Soft coal (in some places, mother-coal streaks)	1	6¼	2	6⅞	2	6⅛	2	5½
Floor, shale.								
Thickness of bed	5	2	5	4¾	4	4⅜	5	½
Thickness of coal sampled	5	2	5	4¾	4	4⅜	5	½

Section A (sample 7915) was cut from face of main entry, 1,200 feet east of drift mouth.

Section B (sample 7916) was cut from face of main air course, 2,000 feet east of drift mouth.

Section C (sample 8218) was cut from face of left entry 2, off right entry 2, off "C" entry, about 1,400 feet approximately south from opening.

Section D (sample 8219) was cut from pillar in room No. 4, off left entry 1, off right entry 1, off "B" main entry, about 2,600 feet approximately east of opening.

A composite sample was made by mixing samples 7915, 7916, 8218, and 8219 for an ultimate analysis, the results of which are shown under laboratory No. 8301.

Notes.—The coal from this mine, like that from many others in this field, is soft and friable. Owing to light cover, and the consequent circulation of surface waters, it is often "rusty" in appearance, and has three vertical seams of clay; it was undercut in the bottom part of the bed by hand, and was shot down usually with black powder, occasionally with short-flame explosives. There were no screens, so that the entire output was shipped as run-of-mine coal. The daily output at time of sampling and measurement in 1909 averaged about 800 tons, 1,200 tons being a maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 237.

REDSTAR. LAURA MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8001, 8002, 8003, 8118 (p. 237).

Mine.—Laura; Kanawha-New River district; a drift mine at Redstar, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, closely uniform, ranging as mined from about 4 feet 10 inches to 5 feet 8 inches; roof, strongly bedded sandstone, locally underlain with a weak clay shale; floor, hard, smooth, shaly underclay.

The bed was measured and sampled at three points by H. M. Wolflin on June 22, 1909, as described below:

Sections of coal bed in Laura mine at Redstar.

Section	A	B	C
Laboratory No	8001	8002	8003
Roof, strongly bedded sandstone underlain locally with a weak clay shale.	*Ft. in.*	*Ft. in.*	*Ft. in.*
Hard grayish coal	0 11	.. ..	0 9
Bone[a]	0 4½	.. ..	.. ..
Bright coal	1 3	2 7	1 7⅞
Hard gray coal	0 1½	0 1¼	0 8⅛
Bright coal	2 4	2 1⅜	1 4¾
Mother coal, locally harding to shale	0 ¾	0 ⅜	0 ⅜
Bright coal	0 7¾	0 8¼	0 5⅝
Floor, hard, shaly underclay.			
Thickness of bed	5 8½	5 6¼	4 11¾
Thickness of coal sampled	5 4	5 6¼	4 11¾

[a] Not included in sample.

Section A (sample 8001) was cut from face of left air course 4, about 2,700 feet east of drift mouth. The sample was very wet.

Section B (sample 8002) was cut from room 7 on left entry 5, about 2,800 feet southeast of drift mouth.

Section C (sample 8003) was cut from pillar 2 on left entry 2, about 1,800 feet southeast of drift mouth.

A composite sample was made by mixing both face and pillar samples 8001, 8002, and 8003. The results of an ultimate analysis of this sample are shown under laboratory number 8118.

Notes.—The coal at this mine was undercut by hand, and was shot down with black powder or a short-flame explosive. The tipple had bar screens; these were not in use at time of sampling, all coal being shipped in run-of-mine form. The estimated daily output was about 350 tons, the capacity of the mine being approximately 550 tons. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 237.

Redstar. Star Mine.

Sample.—Semibituminous coal; New River field; analyses Nos. 5396 and 5397 (Jamestown No. 6) and analyses Nos. 7988, 7991, 8656, 8657, 8296 (pp. 237, 238).

Mine.—Star; Kanawha-New River district; a drift mine at Redstar, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 4½ to 5½ feet; roof, hard gray shale (good); floor, gray shaly underclay, with smooth surface.

The bed was measured and sampled at two points on June 19, 1909, by J. J. Rutledge, and at two points on August 4, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Star mine at Redstar.

Section	A		B		C		D	
Laboratory No.	7988		7991		8656		8657	
Roof, hard gray shale (good).	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone and coal[a]	0	1	0	2	..	..	..	..
Coal (some sulphur)	..	..	..	..	..	..	0	5
Coal	0	11	1	8	1	9	0	8
Hard gray coal	0	2	0	1½	2	½	2	5
Coal	1	6	2	4	..	..	0	11
Mother coal	0	¼	..	..	..	..	..	..
Coal	0	8	..	..	..	..	..	..
Mother coal	0	½	..	..	..	..	..	..
Coal	0	4	..	..	..	..	..	..
Soft coal (mother-coal streaks)	..	..	..	..	1	5	..	..
Floor, hard gray shaly underclay.								
Thickness of bed	3	8¾	4	3½	5	2½	4	5
Thickness of coal sampled	3	7¾	4	1½	5	2½	4	5

[a] Not included in sample.

Section A (sample 7988) was cut from right entry 21, between rooms 15 and 16, about 9,000 feet northeast of drift mouth.

Section B (sample 7991) was cut from room 15, off left entry 16, about 7,500 feet southwest of drift mouth.

Section C (sample 8656) was cut from face of room 22, off right entry 18.

Section D (sample 8657) was cut from face of main heading, 10,800 feet northwest of drift mouth.

A composite sample was made by mixing samples Nos. 7988 and 7991 for an ultimate analysis, the results of which are shown under laboratory number 8296.

The bed was also measured and sampled at two points by K. M. Way on September 20, 1907, as shown below:

Sections of coal bed in Star mine at Redstar.

Section	A		B	
Laboratory No.	5396		5397	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal and shale[a]	0	2	..	..
Soft coal	..	..	0	5½
Coal	1	3¼	..	..
Hard coal	0	10½	0	3
Soft coal	..	..	0	10½
Coal	0	3½	2	6
Sulphur	0	¼	0	¼
Coal	0	5½	1	2½
Mother coal	0	⅛	..	..
Coal	0	8	..	..
Floor, shale.				
Thickness of bed	3	9⅛	5	3¾
Thickness of coal sampled	3	7⅛	5	3¾

[a] Not included in sample.

Section A (sample 5396) was measured in room 16, on right entry 18, 7,600 feet southwest of the drift mouth.

Section B (sample 5397) was measured in room 12, on left entry 13, 6,700 feet southwest of the drift mouth.

Notes.—The coal was undercut in the bed by hand and with chain machines, and was shot down with black powder. The tipple was equipped with bar screens (14 feet by 6 feet), with 3-inch and 1-inch openings. The coal was picked on the car by four trimmers. The estimated average daily output at time of sampling in 1909 was 950 tons; this was practically a maximum day's run. The future tonnage was to be derived almost entirely from pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 237, 238; also U. S. Geol. Survey Bull. 362, p. 14.

ROBINS. EXPORT MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8284, 8285, 8286, 8315, 8891 (p. 238).

Mine.—Export; Kanawha-New River district; a drift mine near Robins on the Laurel Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, fairly uniform, varying from 2 feet to 4 feet; main roof, tough shale, particles of which at times get mixed with the coal in loading; floor, hard sandstone or clay with smooth but rolling surface.

The bed was measured and sampled at four points by A. J. Hazlewood on July 5, 1909, as described below:

Sections of coal bed in Export mine near Robins.

Section	A		B		C		D	
Laboratory No.	8891		8285		8284		8286	
Roof, tough shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (soft, dirty)[a]	0	3½	..	..	..	..	..	..
Coal (fragile)	3	7¼	2	6½	1	11	3	8
Floor, sandstone (hard).								
Thickness of bed	3	10¾	2	6½	1	11	3	8
Thickness of coal sampled	3	7¼	2	6½	1	11	3	8

[a] Not included in sample.

Section A (sample 8891) was cut from the face of right entry 9.

Section B (sample 8285) was cut from the face of main entry, 1,600 feet from drift mouth.

Section C (sample 8284) was cut from the face of left entry 1, 200 feet from main entry.

Section D (sample 8286) was cut from the face of right entry 9, 500 feet from main entry.

A composite sample was made by mixing samples 8284 and 8285 for an ultimate analysis, the results of which are shown under laboratory No. 8315.

Notes.—The coal at this mine was mined by hand near the top of the bed, and was shot down with black powder. The tipple was not equipped with screens; the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The daily output of the mine in July, 1909, averaged 160 tons, and 200 tons was a maximum day's run. The future output was to be derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 238.

RUSH RUN. RUSH RUN MINE.

Sample.—Semibituminous coal; New River field; (West Virginia No. 6) analyses Nos. 1175, 1176 (p. 239).

Mine.—Rush Run; Kanawha-New River district; a drift mine at Rush Run on the Chesapeake & Ohio Railway.

Coal bed.—Fire Creek (Quinnimont). Carboniferous age, Quinnimont formation. The coal is of fine quality, but the bed is exceedingly irregular in thickness. In the Rush Run mine the coal bed ranges from a few inches to 7 or 8 feet in thickness. The bed lies nearly horizontal and is worked by drifts from the outcrop.

Two sections of the bed were measured and sampled in the mine by J. S. Burrows in 1904.

Sample 1176, measured in room 22 off right entry 9, showed 5 feet of clean coal, and sample 1175, measured in room 10 off left entry 10, showed 5½ feet of clean coal.

Notes.—The coal is classed among the "smokeless" coals and is commercially known as a New River coal. The lump was mostly shipped for steam purposes to large cities having smoke ordinances; some was exported, and a small percentage was used for domestic purposes. Most of the slack was coked at the mine. The output of the mine in 1904 was 800 to 1,000 tons daily, most of which went to large cities in the East and the Middle West.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 857; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1450; Bull. 261, p. 165; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1359; Bull. 261, p. 128; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, pp. 1381, 1382.

For chemical analyses see part I of this bulletin, p. 239; also U. S. Geol. Survey Prof. Paper 48, p. 254; Bull. 261, p. 55.

SCARBRO. SCARBRO MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7895, 7896, 8128, 8187 (p. 239).

Mine.—Scarbro; Kanawha-New River district; a shaft mine, 400 feet in depth, at Scarbro, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from about 4 feet 2 inches to 5 feet 8 inches; roof, strongly bedded sandstone, sometimes underlain with shale; floor, hard shale.

The bed was measured and sampled at two points on June 7, 1909, and at one point on July 7, 1909, by F. J. Simington, as described below:

Sections of coal bed in Scarbro mine at Scarbro.

Section	A		B		C	
Laboratory No	7895		7896		8128	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone or shale.						
Hard gray coal	0	9	..	..	..	..
Bony coal[a]	1	0	..	..	1	8
Coal	1	2	2	1	1	1¼
Hard gray coal	1	4	0	11	0	1⅜
Coal	1	3½	1	4¼	2	4⅜
Floor, hard shale.						
Thickness of bed	5	6½	4	4¼	5	3
Thickness of coal sampled	4	6½	4	4¼	3	7

[a] Not included in sample.

Section A (sample 7895) was cut from face of main southwest entry, about 4,500 feet southwest of shaft.

Section B (sample 7896) was cut from right entry 3, off main north entry, about 3,500 feet northeast of shaft.

Section C (sample 8128) was cut from pillar No. 2, off right entry 2, off main northeast entry, about 4,000 feet east of shaft.

A composite sample was made by mixing samples 7895, 7896, and 8128 for an ultimate analysis, the results of which are shown under laboratory No. 8187.

Notes.—The coal was undercut in bottom part of bed to some extent by machines, but chiefly by hand, and was shot down with a short-flame explosive. Three sizes of coal were prepared: lump, over 5-inch screens; egg, over 2-inch screens, and slack; only two sizes, however, were being shipped at time of sampling, the lump and egg being mixed and shipped as one product. The screens were of the fixed diamond-bar pattern. The daily output in 1909 averaged about 650 tons, and 900 tons was a maximum day's run. The output in the immediate future was to be derived almost entirely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 239.

SCARBRO. WINGROVE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7906, 7907, 8126, 8597, 8183 (p. 239).

Mine.—Wingrove; Kanawha-New River district; a shaft mine, 180 feet in depth, 1 mile from Scarbro, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway and with the Virginian Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from 4 feet 10 inches to 5 feet 5 inches; roof, gray shale, locally indurated.

The bed was measured and sampled at two points on June 8, 1909, and at one point on July 7, 1909, by F. J. Simington, and at one point July 31, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Wingrove mine, 1 mile from Scarbro.

Section	A		B		C		D	
Laboratory No	7906		7907		8126		8597	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	4	2	2¾	0	8
Sulphur and shale streak	..	..	0	¼	..	..	0	¾
Mother coal	0	½	..	..	..	..	..	..
Coal	0	11	0	6½	..	..	1	0
Hard gray coal	2	¾	1	5½	0	4¼	1	9
Coal	1	2¾	2	0	2	5	1	4¼
Floor, hard, shaly underclay.								
Thickness of bed	5	4	5	4¼	5	0	4	10
Thickness of coal sampled	5	4	5	4¼	5	0	4	10

Section A (sample 7906) was cut from face of right entry 5, about 2,500 feet northeast of shaft.

Section B (sample 7907) was cut from face of left entry 4, about 2,500 feet northwest of shaft.

Section C, (sample 8126) was cut from pillar on main west entry, about 2,600 feet west of shaft.

Section D (sample 8597) was cut from face of right entry 3, off main northwest entry, about 2,000 feet from shaft.

A composite sample was made by mixing samples 7906, 7907, and 8126 for an ultimate analysis, the results of which are shown under laboratory No. 8183.

Notes.—The coal was mined with chain machines and punching machines, in the bottom part of the bed, and was shot down with a short-flame explosive. The tipple had fixed diamond-bar screens of 2-inch and 5-inch openings. Three sizes of coal were prepared and shipped: lump, over 5-inch openings; egg, over 2-inch openings, and slack under 2-inch openings. The daily output at time of sampling in 1909 averaged about 400 tons, and 1,000 tons was the capacity of the mine. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 239.

SOUTH CAPERTON. SOUTHSIDE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8151, 8152, 8153, 8185 (p. 239).

Mine.—Southside; Kanawha-New River district; a drift mine at South Caperton, 6 miles below Thurmond, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 3 feet 4 inches to 4 feet; dip, 1¾° NW.; roof, stony gray shale, which did not fall with the coal; floor, hard clay, underlain with shale.

The bed was measured and sampled at three points by R. Y. Williams on July 9, 1909, as described below:

Sections of coal bed in Southside mine at South Caperton.

Section	A		B		C	
Laboratory No	8151		8152		8153	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, strong gray shale.						
Soft, bright coal	0	6	0	9	0	10
Hard, gray, dense coal	0	2	0	2	0	2
Soft, bright coal (mother-coal streaks)	0	9	0	4	0	4
Hard, gray, dense coal	..	..	0	1	0	1
Soft, bright coal	..	..	0	1	0	2½
Hard, gray, dense coal	..	..	0	1	0	1½
Soft, bright coal	1	11⅝	3	4⅛	2	3
Floor, hard clay.						
Thickness of bed	3	4⅝	4	10⅛	4	0
Thickness of coal sampled	3	4⅝	4	10⅛	4	0

Section A (sample 8151) was cut from the face of the straight entry, 5,000 feet from drift mouth.

Section B (sample 8152) was cut from the face of left entry 5, 7,000 feet from drift mouth.

Section C (sample 8153) was cut from the face of the machine entry, 6,000 feet from drift mouth.

A composite sample was made by mixing samples 8151, 8152, and 8153 for an ultimate analysis, the results of which are shown under laboratory No. 8185.

Notes.—The coal at this mine was undercut by hand and chain machines, and was shot down with a short-flame explosive or black powder. The tipple had no screens, the entire output being shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on the car. The daily output in 1909 at time of sampling averaged 450 tons, and 550 tons was a maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 239.

SOUTH NUTTAL. BROWN MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8142, 8143, 8144, 8145, 8196, 8607 (p. 240).

Mine.—Brown; Kanawha-New River district; a drift mine at South Nuttal, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness nearly uniform, ranging as mined from 3 feet 2 inches to 4 feet; dip, 1½° NW.; roof, strong blue shale, which did not fall with the coal and which had a cap rock 6 feet above; floor, hard underclay with smooth surface; cover, for the most part, about 350 feet thick.

The bed was measured and sampled at four points by A. C. Ramsay and R. Y. Williams on July 10, 1909, as described on the following page.

Sections of coal bed in Brown mine at South Nuttal.

Section	A		B		C		D		E	
Laboratory No	8142		8143		8144		8145		8607	
Roof, stony blue shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright, soft coal, tough, short-grained coal, with silver color	0	8½	0	10	..	..	..	..	0	11
Hard, bright coal	..	..	..	..	0	9½	0	9	..	..
Gray, hard, short-grained coal	0	7	0	1	0	1	0	2⅛	0	1¼
Hard, bright coal	..	..	..	..	0	7½	0	3½	..	..
Hard, gray coal	..	..	..	..	..	..	0	½	..	..
Soft, bright coal, longer grained (mother-coal streaks)	1	11	2	3	2	¼	1	9½	2	5¼
Floor, hard shale.										
Thickness of bed	3	2½	3	2	3	6¼	3	⅝	3	5½
Thickness of coal sampled	3	2½	3	2	3	6¼	3	⅝	3	5½

Section A (sample 8142) was cut from the face of the Wheeler entry, 3,500 feet from drift mouth.

Section B (sample 8143) was cut from the face of entry 18, 1,000 feet from drift mouth.

Section C (sample 8144) was cut from the face of the old Locketto entry, 4,000 feet from drift mouth.

Section D (sample 8145) was cut from the face of left entry 1, 1,800 feet from drift mouth.

Section E (sample 8607) was cut from the face of entry 18, 1,000 feet from secondary opening.

A composite sample was made by mixing samples 8142, 8144, and 8145 for an ultimate analysis, the results of which are shown under laboratory No. 8196.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed and was shot down with black powder. The tipple was not equipped with screens; therefore the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The daily output in July, 1909, averaged 550 tons, and 647 tons was the maximum day's run. The output for some time was to be derived mainly from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 240.

STONE CLIFF. STONE CLIFF MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7995, 7998, 8250 (p. 240).

Mine.—Stone Cliff; Kanawha-New River district; a drift mine at Stone Cliff, on the main line of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness, rather irregular, due to local rolls; roof, strongly bedded sandstone, underlain for the most part with blue clay shale; floor, hard, smooth clay; cover, about 150 feet thick. The bed was measured and sampled at two points by David White and H. M. Wolflin on June 19, 1909, as described below:

Sections of coal bed in Stone Cliff mine, at Stone Cliff.

Section	A		B	
Laboratory No	7995		7998	
Roof, sandstone and blue clay shale.	*Ft.*	*in.*	*Ft.*	*in.*
Hard streaked coal	..	..	0	1⅞
Bright coal	0	4	1	4¼
Clay (shaly and mixed with coal)	0	5/16	0	¼
Bright coal	3	6⅜	0	1⅜
Hard gray coal	..	..	0	⅜
Bright coal	..	..	2	6½
Floor, hard smooth clay.				
Thickness of bed	3	10 11/16	5	2⅝
Thickness of coal sampled	3	10 11/16	5	2⅝

Section A (sample 7995) was cut from room 5, off left entry 1, off main entry, 1,400 feet west of drift mouth.

Section B (sample 7998) was cut from room 1, off right entry 1, off main entry, 1,500 feet north of drift mouth.

A composite sample was made by mixing samples 7995 and 7998 for an ultimate analysis, the results of which are shown under laboratory No. 8250.

Notes.—The coal was undercut by hand in the bottom part of bed and was shot down with black powder. The tipple was not equipped with screens, and consequently the entire output was shipped as run-of-mine coal. The mine when measured and sampled in 1909 was running at about its full capacity and was averaging from 250 to 300 tons per day. No pillar pulling was done.

For chemical analyses of this coal see part I of this bulletin, p. 240.

STUART. STUART MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7872, 7873, 8079, 8158 (pp. 240, 241).

Mine.—Stuart; Kanawha-New River district; a shaft mine, 565 feet in depth, at Stuart, on the White Oak Railway, connecting with the Loop Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform (with exception of areas where there are rolls), varying as mined from about 3 feet 8 inches to 4 feet 8 inches; roof, shale of varying character; floor, hard clay.

The bed was measured and sampled at one point by P. M. Riefkin, and at one point by F. J. Simington on June 1, 1909, and at one point by F. J. Simington on July 2, 1909, as described below:

Sections of coal bed in Stuart mine, at Stuart.

Section	A		B		C	
Laboratory No	7872		7873		8079	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	1½	1	3¼	1	2
Mother coal	0	1/16	0	¼	..	..
Hard gray coal	..	..	0	4	0	1
Coal	2	8	0	10	0	3⅛
Mother coal	..	..	0	⅛	0	¼
Coal	..	..	2	1⅜	1	4
Floor, hard underclay.						
Thickness of bed	3	9 9/16	4	7	2	10⅜
Thickness of coal sampled	3	9 9/16	4	7	2	10⅜

Section A (sample 7872) was cut from face of left entry 4, about 2,500 feet northeast of shaft.

Section B (sample 7873) was cut from face of left entry 1, about 1,500 feet northeast of shaft.

Section C (sample 8079) was cut from rib near face of right entry 3, off main east entry, about 1,200 feet southeast of shaft.

A composite sample was made by mixing samples 7872, 7873, and 8079 for an ultimate analysis, the results of which are shown under laboratory No. 8158.

Notes.—The coal was undercut in bed by punchers and by hand, and was shot down with a permissible explosive. The tipple had bar screens with 4-inch and 2-inch spaces. The mine plant had recently been damaged by an explosion. At time of sampling in 1909 the daily output averaged from 100 to 200 tons, but was being rapidly increased and was expected to reach eventually 500 tons or more. The coal was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 240, 241.

STUART. PARRAL MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7874, 7875, 8084, 8967, 8161 (p. 241).

Mine.—Parral Mine; Kanawha-New River district; a shaft mine, 565 feet in depth, one-half mile from Stuart on the White Oak Railway, connecting with the Loup Creek branch of the Chesapeake & Ohio Railway and with the Virginian Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from about 3 feet 8 inches to 4 feet 6 inches; roof, hard shale; floor, hard, black, smooth, shaly underclay.

The bed was measured and sampled at one point on July 1, 1909, by P. M. Riefkin, at two points on July 1, 1909, by F. J. Simington, and at one point on August 28, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Parral mine, ½ mile from Stuart.

Section	A		B		C		D	
Laboratory No.	7875		7874		8084		8967	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard shale.								
Coal (in some places mother-coal streaks)	4	5½	4	3½	1	4	1	5
Hard gray coal	..	..	..	..	0	1¾	0	1½
Coal	..	..	..	..	2	3¼	2	6
Floor, hard, black, smooth, shaly underclay.								
Thickness of bed	4	5½	4	3½	3	9	4	½
Thickness of coal sampled	4	5½	4	3½	3	9	4	½

Section A (sample 7875) was cut from face of left heading 1, off main east entry, about 800 feet northeast of shaft.

Section B (sample 7874) was cut from the face of right entry 3, about 2,600 feet northwest of shaft.

Section C (sample 8084) was cut from the face of left west entry 2, about 1,800 feet southwest of shaft.

Section D (sample 8967) was cut from the face of left entry 1, on east side, about 850 feet northeast of shaft.

A composite sample was made by mixing samples 7874, 7875, and 8084 for an ultimate analysis, the results of which are shown under laboratory No. 8161.

Notes.—The coal was undercut in the bed, and was shot down with a short-flame explosive. The daily output averaged about 300 tons.

For chemical analyses of this coal see part I of this bulletin, p. 241.

SUN. SUN No. 1 MINE.

Sample.—Semibituminous coal; New River field; (West Virginia No. 7) analyses Nos. 1197 and 1198, and analyses Nos. 50, 51, 52, 127, 8099, 8206, 8207, 8208, 8209, 8210, 8291, 9614, 9615 (pp. 241, 242).

Mine.—Sun No. 1; Kanawha-New River district; a shaft mine at Sun, on the Chesapeake & Ohio Railroad.

Coal bed.—Sewell. Carboniferous age, Sewell formation. It occurs from 40 to 70 feet above the Raleigh sandstone and from 320 to 370 feet above the Quinnimont (Fire Creek) coal. At this mine the bed lies nearly horizontal and is reached by a shaft 160 feet deep.

Two sections of the bed were measured and sampled by J. S. Burrows in 1904. Section A (sample 1197) was measured at the face of the left main heading and section

B (sample 1198) was measured at the face of the main entry of "the Straight." At both sections the coal was 5 feet 2 inches thick, without shale partings.

The bed was also measured and sampled at six points by H. M. Wolflin on July 7 to 9, 1909, as described below:

Sections of coal bed in Sun No. 1 mine at Sun.

Section	A		B		C		D		E		F	
Laboratory No	8099		8206		8207		8208		8209		8210	
Roof, sandstone and clay shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal (in places sulphurous)	0	11	0	11	0	8	0	8	1	0	0	9
Hard gray coal (in places bony)	0	2¼	0	7½	0	⅝	..	..	..	..	0	1
Hard coal	..	..	0	8	0	4⅝	..	..	..	..	0	6¼
Bony coal	..	..	..	..	..	..	..	..	..	..	0	1¾
Soft coal	0	9	..	..	0	5¾	0	4⅜	..	..	0	4½
Pyrite	..	..	..	..	..	..	0	⅜	..	..	..	..
Soft coal	..	..	..	..	..	..	0	4	0	5	..	..
Bony coal	..	..	..	..	..	..	0	..	1	1	..	..
Grayish coal	0	6¾	0	5	..	..	0	5½	..	..	..	..
Pyrite	0	⅛	0	¼	..	..	0	⅛	..	..	..	..
Hard grayish coal	1	5¼	1	2¼	2	0	0	10½	1	3	1	4¼
Coal (mother-coal streaks)	1	¾	1	6¾	..	..	..	..	1	11	1	9¾
Shale [a]	..	..	0	3	..	..	..	..	..	..	..	..
Soft coal (mother-coal streaks)	..	..	0	7⅜	1	3¼	1	7⅝	..	..	..	..
Floor, hard, blue, shaly underclay.												
Thickness of bed	4	11⅛	6	3	4	10¼	4	4½	5	8	5	½
Thickness of coal sampled	4	11⅛	6	0	4	10¼	4	4½	5	8	5	½

[a] Not included in sample.

Section A (sample 8099) was cut from face of left air course 9, off main entry, about 3,200 feet approximately southeast of No. 2 shaft.

Section B (sample 8206) was cut from face of left entry 7, off main entry, about 2,500 feet southeast of No. 2 shaft.

Section C (sample 8207) was cut from face of left air course 9, off Carline entry, about 2,600 feet approximately northeast of No. 2 shaft.

Section D (sample 8208) was cut from room 15, off right entry 11, off main entry, about 3,000 feet northeast of No. 2 shaft.

Section E (sample 8209) was cut from face of left entry 3, off Simpson entry, about 2,800 feet south of No. 2 shaft.

Section F (sample 8210) was cut from Tucker's main air course opposite left entry 10, off Tucker entry, about 3,700 feet southeast of No. 1 slope.

A composite sample was made by mixing samples 8099, 8206, 8207, 8208, 8209, 8210, for an ultimate analysis, the results of which are shown under laboratory No. 8291.

The bed was also measured and sampled at three points by A. J. Hazlewood, on August 27, 1909, as shown below:

Sections of coal bed in Sun No. 1 mine at Sun.

Laboratory No	50		51		52	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, firm	1	1	1	2	1	2
Coal, soft	0	11	0	11	1	0
Coal, firm	3	1	3	1½	3	1
Sulphur shale, hard [a]	0	2½	0	2½	0	2½
Coal, fragile	0	6½	0	6	0	6½
Floor, hard shale.						
Thickness of bed	5	10	5	11	6	0
Thickness of coal sampled	5	7½	5	8½	5	7½

[a] Not included in sample.

Each of the three samples was taken in the face of Simpson entry.

A composite sample was made by mixing samples 50, 51, and 52 for an ultimate analysis, the results of which are shown under laboratory No. 127.

The bed was also measured and sampled at two points on December 13, 1909, by P. M. Riefkin, as shown below:

Sections of coal bed in Sun No. 1 mine at Sun.

Laboratory No.	9614		9615	
	Ft.	*in.*	*Ft.*	*in.*
Top coal	0	11	..	..
Coal	..	..	0	7¼
Bone	[a] 0	5¼	0	⅛
Coal	3	½	0	6¼
Bone	..	..	[a] 0	¾
Coal	..	..	1	3⅛
Gray splint	..	..	0	½
Coal	..	..	2	2¼
Thickness of bed	4	4¾	4	8¼
Thickness of coal sampled	3	9½	4	7½

[a] Not included in sample.

Both samples were taken from the face of Collins heading, off right entry 8. The samples were wet when taken.

Notes.—The coal was undercut in the bed, usually by hand and occasionally with chain machines, and was shot down with black powder. There were two tipples at this mine; the one at the shaft (known as No. 2 opening) was equipped with bar screens with 1-inch, 1½-inch, 3-inch, and 5-inch openings. The slack was taken by belt elevator to boilerhouse where there was a large storage bin, and from there was taken to coke ovens as needed. The tipple at the slope (known as No. 1 opening) was also equipped with bar screens with 1½-inch and 4-inch openings, but these screens were not in use, all screened coal being prepared at No. 2 tipple. The coal was picked on the car. The daily output from both openings averaged about 1,200 tons, and an increase was probable. The capacity was about 2,500 to 3,000 tons. The future output was to be derived principally from advance work.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 873; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1248; Bureau of Mines Bull. 13, pp. 216, 276; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1361; Bull. 261, p. 128; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1383.

For chemical analyses see part I of this bulletin, pp. 241, 242; also U. S. Geol. Survey Prof. Paper 48, p. 255; Bull. 261, p. 56.

THAYER. EPHRAIMS CREEK (BUFFALO) MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8167, 8174, 8175, 8199, 8213, 8290 (pp. 242, 243).

Mine.—Ephraims Creek (Buffalo); Kanawha-New River district; a drift mine at Thayer, on the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Pottsville formation. Thickness from 2 feet 6 inches to 3 feet 3 inches; main roof, dark shale of good quality with a smooth surface; roof has a thickness of 6 feet up to the sandstone cap rock; floor, hard gray underclay with rather smooth surface; cover, from 30 to 250 feet thick.

The bed was measured and sampled at four points by J. J. Rutledge and at one point by J. W. Groves on July 7 and 8, 1909, as described below:

Sections of coal bed in Ephraims Creek (Buffalo) mine at Thayer.

Section	A		B		C		D		E	
Laboratory No	8167		8174		8175		8199		8213	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Reef, dark shale.										
Bony coal ("brickle")	2	1	..	..	..	..	..	..	..	..
Coal	..	..	3	7½	0	6½	1	4	0	9
Gray coal[a]	0	6	..	..	..	..	0	6	..	..
Coal (mother-coal streaks)	..	..	..	..	0	⅛	..	..	0	¼
Coal	1	9½	..	..	2	10½	1	8	2	9½
Floor, hard gray underclay.										
Thickness of coal bed	4	4½	3	7½	3	5⅛	3	6	3	6¾
Thickness of coal sampled	3	10½	3	7½	3	5⅛	3	0	3	6¾

[a] Not included in sample.

Section A (sample 8167) was cut from room 1, off Slater Hill to Buffalo haulway, 2,300 feet northeast of drift mouth.

Section B (sample 8174) was cut from the face of room 2, off left entry 2, off left entry 9, 3,200 feet northwest of drift mouth.

Section C (sample 8175) was cut from point near face of right entry 9, off right entry 2, 3,400 feet north of drift mouth.

Section D (sample 8199) was cut from the face, 1,000 feet west of drift mouth.

Section E (sample 8213) was cut from the face of north heading, 5,000 feet north of drift mouth.

A composite sample was made by mixing samples 8167, 8174, 8175, 8199, and 8213 for an ultimate analysis, the results of which are shown under laboratory No. 8290.

Notes.—The coal at this mine was undercut by electric chain cutters and by hand, and was shot down with black powder. The tipple was equipped with bar screens with 1½ and ¾ inch spaces. The coal was picked on the cars by four or five trimmers. The daily output in July, 1909, averaged 1,100 tons, and 1,200 tons was a maximum day's run. The output in the near future was to be derived largely from pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 242, 243.

THURMOND. THOMAS MINE.

Sample.—Semibituminous coal; New River field; analysis No. 8600 (p. 243).

Mine.—Thomas; Kanawha-New River district; a drift mine, 1 mile from Thurmond, on the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Pottsville formation. Thickness, 2 feet 8 inches; roof, soft shale; floor, underclay with smooth surface.

The bed was measured and sampled at one point by A. J. Hazlewood on July 30, 1909.

Sample 8600 was cut from the face of room 5 on entry 2, 500 feet west of the drift mouth. It represented 2 feet 8½ inches of coal.

Notes.—The coal at this mine was undercut with picks, and was shot down with black powder. The coal was loaded in run-of-mine form, there being no screens at the tipple. The estimated output of this mine in July, 1909, was 100 tons per day, and was derived entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 243.

THURMOND. MINDEN NO. 1 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8241, 8240, 8300 (p. 243).

Mine.—Minden No. 1; Kanawha-New River district; a drift mine 1¼ miles northwest of Thurmond, on the Minden Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Pottsville formation. Thickness, fairly uniform, ranging from 4½ feet to 5½ feet. The roof is a dark-blue shale, pieces of which at times got mixed with the coal in loading. There is a cap rock of sandstone 5 inches above the coal. The floor is a hard clay with a smooth surface.

The bed was measured and sampled at two points by David White on July 12, 1909, as described below:

Sections of coal bed in Minden No. 1 mine, 1¼ miles northwest of Thurmond.

Section	A		B	
Laboratory No.	8240		8241	
	Ft.	*in.*	*Ft.*	*in.*
Roof, dark-blue shale.				
Bony coal (frozen to roof)	*a* 0	2⅜	*a* 0	1¾
Coal (coarse, hard, gritty)	..	..	*a* 0	3¼
Coal (tender, brittle)	2	9	..	..
Coal (brittle mother-coal streaks)	0	2	2	6½
Bony coal, hard, gray	0	⅝	*a* 0	⅝
Coal	1	6⅜	2	9⅞
Mother coal	0	¼	..	..
Black shale	..	..	*a* 0	¼
Coal (hard, tough)	1	5¼	..	..
Coal (bright)	..	..	0	1½
Floor, hard underclay.				
Thickness of bed	6	1⅞	5	11¾
Thickness of coal sampled	5	11½	5	5⅞

a Not included in sample.

Section A (sample 8240) was cut from pillar in right entry 2, near right entry 3, 1,000 feet from drift mouth.

Section B (sample 8241) was cut from pillar in left entry 3, 1,200 feet southeast of drift mouth.

A composite sample was made by mixing samples 8240 and 8241 for an ultimate analysis, the results of which are shown under laboratory No. 8300.

Notes.—The coal was undercut by hand at bottom of bed. It was not screened but was shipped in run-of-mine form without picking. It is a coking coal, but no coke was being made at the time of sampling in 1909. The daily output in July, 1909, averaged 200 tons, and the maximum day's run was 225 tons. The output was derived almost entirely from pillars.

For chemical analyses, see part I of this bulletin, p. 243; also U. S. Geol. Survey Bull. 362, p. 33.

THURMOND. ECHO (BEURY) MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8242, 8243, 8289 (p. 243).

Mine.—Echo (Beury); Kanawha-New River district; a drift mine 2 miles west of Thurmond, on the main line of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Pottsville formation. Thickness, fairly uniform, averaging about 4½ feet; roof, heavy blue shale with a smooth surface. The cap rock of sandstone is 24 feet above the coal. The floor is a hard smooth underclay.

The bed was measured and sampled at two points by David White on June 30, 1909, as described below:

Sections of coal bed in Echo (Beury) mine, 2 miles west of Thurmond.

Section	A		B	
Laboratory No.	8242		8243	
	Ft.	*in.*	*Ft.*	*in.*
Roof, heavy blue shale, smooth surface.				
Coal, clean, bright	0	5¼	0	3¼
Coal, bright, prismatic	..	..	0	11
Mother-coal streak	0	1	..	..
Hard gray bony coal	0	1¼	..	..
Bright coal (mother-coal streak)	0	4¾	..	..
Coal (mother-coal streak)	..	..	0	10½
Coal, dense, granular	1	1	1	1½
Coal, hard, bright	0	5¾	1	½
Coal, tender (mother-coal streak)	1	10	..	..
Shale, parting	0	¼	0	⅛
Coal, clean, bright	0	⅝	0	¾
Floor, hard smooth underclay.				
Thickness of bed	4	5⅞	4	3⅝
Thickness of coal sampled	4	5⅞	4	3⅝

Section A (sample 8242) was cut from Baltimore heading, left entry 5, 1½ miles from drift mouth.

Section B (sample 8243) was cut from Echo No. 2 or Klondike drift, left entry 1, 1,900 feet from drift mouth.

A composite sample was made by mixing samples 8242 and 8243 for an ultimate analysis, the results of which are shown under laboratory No. 8289.

Notes.—The coal at this mine was undercut at the bottom part of the bed. The coal was all shipped in run-of-mine form without being picked. The daily output averaged 200 tons, and 250 tons was a maximum day's run in June, 1909. A large part of the old mine was abandoned on account of a squeeze. The mine was approaching exhaustion and the future tonnage was to be derived principally from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 243.

THURMOND. RUSH RUN MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 5327 and 5328 (Jamestown No. 4), and analyses Nos. 8096, 8097, 8100, 8160 (p. 243).

Mine.—Rush Run; Kanawha-New River district; a drift mine, 3 miles northwest of Thurmond, on the Chesapeake & Ohio Railway.

Coal bed.—Locally known as the Fire Creek, and is the same as the Quinnimont bed of the West Virginia Geological Survey. Carboniferous age, Quinnimont formation. At this mine the bed lies nearly flat, and has an average thickness of about 5 feet. Roof, sandstone or strong gray shale which does not fall with the coal; floor, shale or hard underclay with smooth surface.

The bed was measured and sampled at two points by K. M. Way on September 12, 1907, as shown below:

Sections of coal bed in Rush Run mine, 3 miles north of Thurmond.

Section	A		B	
Laboratory No.	5328		5327	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandstone.				
Coal	0	4¾	0	4½
Bony coal	[a] 0	1½	0	½
Coal	4	3	4	8
Mother coal	0	¼	..	..
Coal	0	5	..	..
Floor, shale.				
Thickness of bed	5	2½	5	1
Thickness of coal sampled	5	1	5	1½

[a] Not included in sample.

Section A (sample 5328) was measured in room 23 on right entry 8, 4,500 feet southwest of the drift mouth.

Section B (sample 5327) was measured in room 18 on right entry 10, 5,700 feet south of the drift mouth.

The bed was also measured and sampled at three points by A. C. Ramsay on July 3, 1909, as described below:

Sections of coal bed in Rush Run mine, 3 miles northwest of Thurmond.

Section	A		B		C	
Laboratory No	8096		8097		8100	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, strong gray shale.						
Soft bright coal (mother-coal streaks)	0	5	0	4½	0	5
Shale band	[a] 0	1½	0	¼	[a] 0	2
Gray coal	..	..	0	3	..	..
Soft bright coal (mother-coal streaks)	0	7	0	5½	0	5
Gray coal	0	2	..	..	0	6
Soft bright coal	1	9	1	4½	1	7
Hard gray coal	..	..	0	½	1	0
Bright coal	1	5	1	3½	0	7
Sulphur streak	..	..	..	..	0	⅛
Soft coal	1	1½	0	9½	0	7¼
Floor, hard underclay.						
Thickness of bed	5	7	4	7¼	5	3⅜
Thickness of coal sampled	5	5½	4	7¼	5	1⅜

[a] Not included in sample.

Section A (sample 8096) was cut from the face of left entry 7.

Section B (sample 8097) was cut from the face of room 4 on right air course 11, 5,000 feet from drift mouth.

Section C (sample 8100) was cut from a pillar on right entry 7, 3,500 feet from drift mouth.

A composite sample was made by mixing both face and pillar samples 8096, 8097, and 8100 for an ultimate analysis, the results of which are shown under laboratory No. 8160.

Notes.—The coal at this mine was undercut both by hand and with chain machines, and was shot down with a short-flame explosive. The tipple had bar screens, with 3-inch and 1¼-inch spaces. The screenings were coked in beehive ovens. The coal was picked on the car. The daily output at time of sampling in 1909 averaged 300 tons, although the mine had a larger capacity. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal see part I of this bulletin, p. 243; also U. S. Geol. Survey Bull. 362, p. 12.

THURMOND. RED ASH MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8070, 8071, 8072, 8108 (p. 244).

Mine.—Red Ash; Kanawha-New River district; a drift mine 3½ miles west of Thurmond, on the Chesapeake and Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. Thickness somewhat irregular, due to large rolls in the roof, ranging as mined from 4 feet 9 inches to 7 feet; roof, strong gray shale, which does not fall with the coal; floor, fairly hard clay, with smooth surface.

The bed was measured and sampled at three points by R. Y. Williams on July 3, 1909, as described below:

Sections of coal bed in Red Ash mine, $3\frac{1}{2}$ miles west of Thurmond.

Section	A		B		C	
Laboratory No.	8070		8071		8072	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, strong gray shale.						
Bright soft coal (mother-coal streaks)	0	$4\frac{5}{8}$	0	5	0	6
Bony coal band	0	$\frac{1}{4}$	0	$\frac{1}{8}$	[a] 0	$4\frac{3}{4}$
Bright soft coal (mother-coal streaks)	0	$5\frac{1}{8}$	0	$6\frac{3}{4}$	3	5
Slightly grayish coal	0	$11\frac{1}{2}$	0	9	1	3
Bright soft coal (mother-coal streaks)	1	$1\frac{1}{2}$	1	$8\frac{3}{8}$	1	5
Harder grayish coal	1	5	0	2	..	..
Bright soft coal (mother-coal streaks)	0	5	1	9	..	..
Floor, fairly hard clay.						
Thickness of bed	4	9	5	$4\frac{1}{4}$	6	$11\frac{3}{4}$
Thickness of coal sampled	4	9	5	$4\frac{1}{4}$	6	7

[a] Excluded from sample.

Section A (sample 8070) was cut from the face of cross entry 1, off left entry 10, $1\frac{1}{2}$ miles from drift mouth.

Section B (sample 8071) was cut from a pillar of room 1 on left entry 7, $1\frac{1}{4}$ miles south of drift mouth.

Section C (sample 8072) was cut from the face of the coal, $1\frac{1}{4}$ miles southwest of the drift mouth.

A composite sample was made by mixing both face and pillar samples 8070, 8071, and 8072 for an ultimate analysis, the results of which are shown under laboratory No. 8108.

Notes.—The coal at this mine was undercut both by hand and with chain machines in bottom part of bed, and was shot down with a short-flame explosive. The tipple had bar screens, with 3-inch and $1\frac{1}{4}$-inch spaces, and the screenings were coked in beehive ovens. The coal was picked on car. The estimated daily output was 450 tons, and 1,000 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 244.

TURKEY KNOB. TURKEY KNOB MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8035, 8036, 8047, 8048, 8103 (p. 243).

Mine.—Turkey Knob; Kanawha-New River district; a drift mine at Turkey Knob, on the Loup Creek Branch of the Chesapeake & Ohio Railway, $\frac{1}{2}$ mile from Macdonald.

Coal bed.—Known as the Sewell. Carboniferous age, Sewell formation. Thickness rather variable, ranging as mined from 6 feet 5 inches to 4 feet 4 inches; roof, clay shale (locally of sandstone), underlain with $\frac{1}{4}$ inch to 3 inches of draw clay shale; floor, hard, gray, shaly clay with smooth surface; cover, for the most part, 100 to 150 feet thick, possibly more.

The bed was measured and sampled at four points by H. M. Wolflin on June 25 and 27, 1909, as described below:

Sections of coal bed in Turkey Knob mine at Turkey Knob.

Section	A		B		C		D	
Laboratory No.	8035		8036		8048		8047	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, clay shale.								
Coal, with streaks of sulphur or of mother coal in places	0	$9\frac{3}{8}$	0	$7\frac{1}{4}$	0	$8\frac{1}{4}$	2	6
Hard gray coal	0	$1\frac{5}{8}$	0	$1\frac{1}{4}$	..	..	..	..
Soft coal	1	9	0	$7\frac{3}{4}$	1	$4\frac{1}{2}$	..	..
Hard coal	..	..	1	$1\frac{5}{8}$	..	..	..	..
Hard gray coal	1	$\frac{5}{8}$	0	1	0	1	0	1
Coal (mother-coal streaks)	2	$8\frac{5}{8}$	2	$\frac{5}{8}$	2	$2\frac{1}{2}$	2	$5\frac{1}{2}$
Floor, hard gray shaly clay.								
Thickness of bed	6	$5\frac{1}{4}$	4	$7\frac{1}{2}$	4	$4\frac{1}{4}$	5	$\frac{1}{2}$
Thickness of coal sampled	6	$5\frac{1}{4}$	4	$7\frac{1}{2}$	4	$4\frac{1}{4}$	5	$\frac{1}{2}$

Section A (sample 8035) was cut from the face of left entry 15, about 6,000 feet southeast of drift mouth.

Section B (sample 8036) was cut from room 10, off right entry 14, about 6,000 feet southeast of drift mouth.

Section C (sample 8048) was cut from face of haulway, off right entry 7, about 4,000 feet southeast of drift mouth.

Section D (sample 8047) was cut from pillar in room 19 on left entry 12, 5,400 feet east of drift mouth.

A composite sample was made by mixing samples 8035, 8036, 8047, and 8048 for an ultimate analysis, the results of which are shown under laboratory No. 8103.

Notes.—The coal from this mine, like that from many others in this field, is soft and friable, and in ordinary mining operations makes rather a high percentage of slack. This slack was finely crushed and coked in beehive ovens. The coal was undercut, usually with pick, in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar and shaking screens and a crusher for treating the slack. The daily output at time of sampling in 1909 averaged about 625 tons, and the capacity was approximately 800 tons. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 243.

WHIPPLE. WHIPPLE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 7889, 7890, 8098, 8599, 8157 (pp. 244, 245).

Mine.—Whipple; Kanawha-New River district; a shaft mine, 456 feet in depth at Whipple, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway, and with the Virginian Railway.

Coal bed.—Known in this field as the Sewell bed. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from about 4 feet 1 inch to about 5 feet 1 inch; roof, sandstone, underlain for the most part with a hard shale; floor, hard, smooth, shaly underclay.

The bed was measured and sampled at two points on June 5, 1909, and at one point on July 6, 1909, by F. J. Simington, and at one point on August 2, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Whipple mine at Whipple.

Section	A		B		C		D	
Laboratory No.	7889		7890		8098		8599	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard shale or sandstone.								
Coal (pyrite streaks)	0	5¾	..	..	..	..	..	..
Coal	1	3½	2	0	1	5	1	5
Hard gray coal	..	8	1	¼	..	1	1	6
Mother coal	..	¼	..	¾	..	..	..	..
Coal	1	10¾	1	11	2	8	1	11½
Floor, shaly underclay.								
Thickness of bed	4	4¼	5	0	4	2	4	10½
Thickness of coal sampled	4	4¼	5	0	4	2	4	10½

Section A (sample 7889) was cut from heading 1 in rock heading district, about 4,000 feet north of shaft.

Section B (sample 7890) was cut from room 14, off entry 16, 3,000 feet west of shaft.

Section C (sample 8098) was cut from rib near face of right entry 3, off main dip entry.

Section D (sample 8599) was cut from face of left entry 1, off Harvey's entry.

A composite sample was made by mixing samples 7889, 7890, and 8098 for an ultimate analysis, the results of which are shown under laboratory number 8157.

Notes.—The coal was undercut in the bed by punching machines and chain machines, and was shot down with a short-flame explosive The tipple had shaking screens. Three sizes of coal were prepared and shipped: Lump, over 4-inch openings, egg, over 1¾-inch openings, and slack, under 1¾-inch openings. The daily average output at time of sampling in 1909 was about 600 tons, and 1,000 tons was approximately the capacity of the mine. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 244, 245.

Winona. Smokeless Mine.

Sample.—Semibituminous coal; New River field; analyses Nos. 5467 and 5468 (Jamestown No. 9), and analyses Nos. 8132, 8133, 8134, 8186 (p. 245).

Mine.—Smokeless; Kanawha-New River district; a drift mine, at Winona, on the Chesapeake & Ohio Railway.

Coal bed.—Known as the Sewell. It is of Carboniferous age, Sewell formation. The bed at this mine lies nearly flat, and has an average thickness of 3 feet 10 inches. The roof is shale or strong blue shale which does not fall with coal; floor, shale or hard clay with smooth surface. The coal is clean, with no streaks of shale or "sulphur." There are fairly regular benches separated by thin streaks of mother coal. Cover, for the most part, 150 to 300 feet thick.

The bed was measured and sampled at two places in the mine by K. M. Way on October 12, 1907, as shown below:

Sections of coal bed in Smokeless mine at Winona.

Section	A		B	
Laboratory No	5467		5468	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	5	1	4
Hard coal	0	1½	0	1½
Coal	0	11½	0	9½
Mother coal	[a] 0	½	0	¼
Coal	0	6	0	3
Mother coal	..	¼	[a] 0	¾
Coal	0	10	..	4¼
Mother coal	..	..	[a] 0	½
Coal	..	..	0	10
Floor, shale.				
Thickness of bed	3	10¾	3	9¾
Thickness of coal sampled	3	10¼	3	8½

[a] Not included in sample.

Section A (sample 5467) was measured in left entry 1 for motor hauls, 1,800 feet southeast of the mine opening.

Section B (sample 5468) was measured in right heading 1, off the main entry, 2,500 feet south of the mine opening.

The bed was also measured and sampled at three points by A. C. Ramsay on July 6, 1909, as described below:

Sections of coal bed in Smokeless mine at Winona.

Section	A		B		C	
Laboratory No	8132		8133		8134	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, strong blue shale.						
Medium hard bright coal	1	4	1	7	1	5
Hard gray coal	0	3½	0	5	0	1½
Medium hard bright coal	1	9	2	2½	0	2¼
Mother coal to gray coal	0	2	0	1½	0	1¼
Soft bright coal	0	1½	0	½	1	11
Floor, hard clay.						
Thickness of bed	3	8	4	4½	3	9
Thickness of coal sampled	3	8	4	4½	3	9

Section A (sample 8132) was cut from the face of the Adams entry, 2,200 feet from drift mouth.

Section B (sample 8133) was cut from the face of left entry 3, 2,000 feet from drift mouth.

Section C (sample 8134) was cut from a pillar between left cross entries 14 and 15, off old Hill main entry, 1,500 feet from drift mouth.

A composite sample was made by mixing face and pillar samples 8132, 8133, and 8134 for an ultimate analysis, the results of which are shown under laboratory number 8186.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed, and was shot down with a short-flame explosive or black powder. The tipple had no screens, and therefore the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The daily output at time of sampling averaged about 450 tons, and 650 tons was a maximum day's run. The future output was to be derived from both advance work and pillars.

For results of steaming tests of this coal, see U. S. Geol. Survey Bull. 385, p. 25.

For chemical analyses see part I of this bulletin, p. 245; also U. S. Geol. Survey Bull. 362, p. 17.

WINONA. DUBREE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8147, 8148, 8191 (p. 245).

Mine.—Dubree; Kanawha-New River district; a drift mine ½ mile west of Winona, on the Keeneys Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. At this mine the bed ranges in thickness as mined from 3 feet to 3 feet 6 inches and dips gently NE.; roof, hard, brittle sandstone which does not fall with the coal; floor, hard clay with smooth surface.

The bed was measured and sampled at two points by R. Y. Williams on July 6, 1909, as described below:

Sections of coal bed in Dubree mine, ½ mile from Winona.

Section	A		B	
Laboratory No.	8147		8148	
Roof, hard, brittle sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	9	0	10½
Hard black coal	0	⅛	..	..
Hard, dull, dense gray coal	0	4	0	4
Soft bright coal	..	..	0	9
Mother-coal streak	..	..	0	⅛
Soft bright coal (mother-coal streaks)	2	1¾	1	5¼
Floor, hard clay.				
Thickness of bed	3	2⅞	3	4⅞
Thickness of coal sampled	3	2⅞	3	4⅞

Section A (sample 8147) was cut from the face of room 7 on right entry 7.

Section B (sample 8148) was cut from the face of left entry 7.

A composite sample was made by mixing samples 8147 and 8148 for an ultimate analysis, the results of which are shown under laboratory number 8191.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed, and was shot down with black powder. The tipple was not equipped with screens, and therefore the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on car by one trimmer. The estimated daily output was about 300 tons, which was about a maximum day's run. The output for some time was to be derived almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 245.

HANCOCK COUNTY.

ZALIA. COUNTRY BANK.

Sample.—Bituminous coal; Wheeling field; analysis No. 1594 (p. 245).

Location.—Country bank; Wheeling district; at Zalia.

Coal bed.—Mahoning. The coal is of Carboniferous age, Conemaugh formation.

The bed was measured and sampled by W. T. Griswold in 1904. The sample included a 3-foot 4-inch cut and represented the entire bed.

For chemical analyses of this coal see part I of this bulletin, p. 245; also U. S. Geol. Survey Prof. Paper 48, p. 275.

ZALIA. COUNTRY BANK.

Sample.—Bituminous coal; Wheeling field; analysis No. 1572 (p. 245).

Location.—Country bank; Wheeling district; at Zalia.

Coal bed.—Rogers or Lower Freeport. The coal is of Carboniferous age, Allegheny formation.

The bed was measured and sampled by W. T. Griswold in 1904. The sample was taken from a 3-foot cut, and represented the entire bed.

For chemical analyses of this coal see part I of this bulletin, p. 245; also U. S. Geol. Survey Prof. Paper 48, p. 274.

HARRISON COUNTY.

CLARKSBURG. PITCAIRN MINE.

Sample.—Bituminous coal; Fairmont field; (West Virginia No. 2) analyses Nos. 1103, 1104 (p. 246).

Mine.—Pitcairn; Monongahela district, at Clarksburg.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. The bed lies nearly horizontal, and is worked by a drift at this mine, where it has a maximum thickness of 8 feet 6 inches, and a minimum thickness of 7 feet. The parting is extremely variable, being found anywhere in the upper part of the bed.

Sections of the bed were measured and sampled by J. S. Burrows in 1904 at two points, as shown below:

Sections of coal bed in Pitcairn mine at Clarksburg.

Section	A		B	
Laboratory No.	1104		1103	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	1	2	8¼
Shale [a]	0	¾	0	¾
Coal	6	0	6	1
Thickness of bed	7	1¾	8	10
Thickness of coal sampled	7	1	8	9¼

[a] Not included in sample.

Section A (sample 1104) was measured at the face of right entry 3.

Section B (sample 1103) was measured at the face of left entry 4.

Notes.—The Pittsburgh coal at this mine has the same general characteristics as at other mines in the district. In 1904 the entire output of the mine, about 400 tons daily, was used by the Pittsburg Plate Glass Co.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 825; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1471; Bull. 261,

p. 71; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1354; Bull. 261, p. 127; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1375.

For chemical analyses see part I of this bulletin, p. 246; also U. S. Geol. Survey Bull. 261, p. 53.

CLARKSBURG. OCEAN MINE.

Sample.—Bituminous coal; Fairmont field; (West Virginia No. 15) analyses Nos. 2039, 2040 (p. 246).

Mine.—Ocean; Monongahela district; a drift mine, 3 miles east of Clarksburg, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. At this mine, the bed lies nearly flat and ranges from 6 to 8 feet thick. The roof is of shale, but in mining, 12 to 14 inches of coal is left for a roof. The floor is a hard fire clay.

The bed was measured and sampled at two points by W. J. von Borries and J. S. Burrows on August 22, 1905, as shown below:

Sections of coal bed in Ocean mine, 3 miles east of Clarksburg.

Section	A		B	
Laboratory No	2039		2040	
	Ft.	*in.*	*Ft.*	*in.*
Roof, coal.				
Coal	0	9½	1	5
Bone [a]	0	¼	0	2
Coal	0	7¾	0	6
Bone [a]	0	1¼	0	2½
Coal	4	9	4	6½
Floor, fire clay.				
Thickness of coal sampled	6	2¼	6	5½

[a] Not included in sample.

Section A (sample 2039) was measured in butt entry 2, off face entry 3, 2,750 feet northwest of the mine opening.

Section B (sample 2040) was measured in room 7, on butt entry 3, off face entry 2, 2,025 feet northeast of the mine opening.

Notes.—The capacity of this mine in 1905 was 600 to 900 tons daily. The coal was largely sold for steam production, most of it being shipped to tidewater points in run-of-mine form.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 207; Bureau of Mines Bull. 23, pp. 69, 186; coking tests: U. S. Geol. Survey Bull. 290, p. 208; Bull. 336, pp. 25, 34, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 57, 58, 61, 64.

For chemical analyses see part I of this bulletin, p. 246; also U. S. Geol. Survey Bull. 290, p. 206.

KANAWHA COUNTY.

ACME. KEYSTONE MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 20) analyses Nos. 2375, 2376 (p. 246).

Mine.—Keystone; a drift mine in the Kanawha-New River district, at Acme, on the Chesapeake & Ohio Railway.

Coal bed.—Locally known as the No. 2 Gas. Carboniferous age, Kanawha formation. The bed lies nearly flat, having an average dip of about 1½ feet in 100. The average thickness is about 5 feet. The roof is good, being a hard gray shale, containing, in places, pyrites. The floor is a hard gray shale.

The bed was measured and sampled at two points in the mine by J. W. Groves on October 26, 1905, as shown on the following page.

Sections of coal bed in Keystone mine at Acme.

Section	A		B	
Laboratory No.	2375		2376	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	10	2	0
Mother coal	0	½	..	..
Sulphur [a]	..	..	0	½
Coal	1	3	0	10
Hard coal	0	3	0	4
Coal	0	4	0	2
Shale [a]	0	½	..	..
Hard coal	0	1	0	2
Coal	0	11	0	5
Shale [a]	..	..	0	¼
Hard coal	..	..	0	1½
Coal	..	..	1	7
Floor, shale.				
Thickness of bed	4	9	5	8¼
Thickness of coal sampled	4	8½	5	7½

[a] Not included in sample.

Section A (sample 2375) was measured in left entry 8, 4,600 feet east of the drift mouth.

Section B (sample 2376) was measured in room 16, off right entry 5, 3,500 feet east of the drift mouth.

Two inches of draw slate overlying the coal in section B is local. The bands of hard coal shown in the sections are fairly regular.

Notes.—The coal from this mine, like that from many other mines in this district, is largely used for steam production.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 218; Bureau of Mines Bull. 23, pp. 69, 187; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 220; Bureau of Mines Bull. 13, pp. 222, 276; washing tests: U. S. Geol. Survey Bull. 290 p. 220; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 221; Bull. 336, pp. 26, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses see part I of this bulletin, p. 246; also U. S. Geol. Survey Bull. 290, p. 218.

CHARLESTON. BLACK BAND NO. 2 MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 25) analyses Nos. 4290, 4291 (pp. 246, 247).

Mine.—Black Band No. 2; Kanawha-New River district; a drift mine 8 miles southeast of Charleston, on the Chesapeake & Ohio Railway.

Coal bed.—Black Band or Winifrede of the West Virginia Geological Survey. Carboniferous age, Allegheny (?) formation. At this mine the bed is nearly regular, averaging 2 feet 4 inches in thickness. It lies nearly flat. The roof is good, of regular sandstone. The floor is shaly sandstone, with 1½ to 6 inches of shale between the coal and the sandstone. It is a good floor to shovel from.

The bed was measured and sampled at two points by J. W. Groves and A. K. Adams on December 4, 1906, as shown below:

Sections of coal bed in Black Band No. 2 mine, 8 miles southeast of Charleston.

Section	A		B	
Laboratory No.	4290		4291	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	5½	0	9
Hard coal	0	½	0	1
Coal	0	2¾	0	11
Hard coal	..	..	0	1
Coal	..	..	1	¾
Floor, shale.				
Thickness of bed	2	8¾	2	10¾
Thickness of coal sampled	2	8¾	2	10¾

Section A (sample 4290) was measured in the face entry, 1,300 feet south of the drift mouth.

Section B (sample 4291) was measured in the face entry, 800 feet west of drift mouth.

Notes.—The approximate daily output of this mine in 1906 was 225 tons per day. The thin coal was washed at a washery 12 miles from the mine.

For results of tests of this coal, see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 283; Bureau of Mines Bull. 13, pp. 223, 277; coking tests: U. S. Geol. Survey Bull. 332, p. 284; Bull. 336, pp. 26, 35, 45.

For chemical analyses see part I of this bulletin, pp. 246, 247; also U. S. Geol. Survey Bull. 332, p. 285.

HERNSHAW. MARMET MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 22) analyses Nos. 3456, 3457 (p. 247).

Mine.—Marmet, a drift mine in the Kanawha-New River district, at Hernshaw, on the Chesapeake & Ohio Railway.

Coal bed.—The bed worked at this mine had not, at the time the mine was visited, been definitely correlated with any of the well-known coals of the Kanawha region. It is of Carboniferous age, Kanawha formation. The bed lies nearly flat, and at this mine has an average thickness of 5 feet 9¾ inches. The roof is a hard gray shale; in places carries streaks of coal. The floor is a hard gray shale. The coal is in two benches, separated by a band of shale 6 to 18 inches thick. The upper bench is 2 to 4 feet thick and the lower bench 1 to 2 feet thick.

The bed was measured and sampled at two points by J. W. Groves on July 19, 1905, as shown below:

Sections of coal bed in Marmet mine at Hernshaw.

Section	A		B	
Laboratory No	3456		3457	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	7	1	6
Hard coal	0	9	0	8
Coal	1	2½	0	4
Shale [a]	1	4	0	8
Coal	1	8	1	1
Floor, shale.				
Thickness of bed	6	6½	4	3
Thickness of coal sampled	5	2	3	7

[a] Not included in sample.

Section A (sample 3456) was measured in a room 400 feet east of the drift mouth.

Section B (sample 3457) was measured in a room 1,200 feet east of the drift mouth.

Notes.—The output of this mine was sold for steam production and for domestic use in slack, nut, lump, and run-of-mine sizes. The daily output of the mine in July, 1905, was about 400 tons per day.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 280; Bureau of Mines Bull. 23, pp. 70, 187; washing tests: U. S. Geol. Survey Bull. 332, p. 281; Bull. 336, p. 14.

For chemical analyses see part I of this bulletin, p. 247; also U. S. Geol. Survey Bull. 332, p. 280.

MONARCH. MONARCH MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 23) analyses Nos. 3458, 3459 (p. 247).

Mine.—Monarch, a drift mine in the Kanawha-New River district at Monarch, on the Kanawha & Michigan Railroad.

Coal bed.—Cedar Grove. Carboniferous age, Kanawha formation. The bed at this mine is of nearly uniform thickness, being about 3 feet 1¼ inches. It lies nearly flat. The roof is gray shale, about 6 inches of which—called draw slate—is taken down in mining. The floor is a hard gray shale.

The bed was measured and sampled at two points by J. W. Groves and F. B. Tough on July 21, 1906, as shown below:

Sections of coal bed in Monarch mine at Monarch.

Section	A		B	
Laboratory No	3458		3459	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	1	1	10
Bone and shale	0	¼	..	..
Hard coal and shale	..	..	0	1
Coal	1	3	1	3
Gray band	0	1	..	..
Coal	0	8	..	..
Floor, shale.				
Thickness of coal	3	1¼	3	2
Thickness of coal sampled	3	1¼	3	2

Section A (sample 3458) was measured in right entry 1, 1,500 feet north of the drift mouth.

Section B (sample 3459) was measured in right entry 5, 1,500 feet northwest of the drift mouth.

Notes.—The coal produced at this mine is a splint, and is shipped in run-of-mine, lump, nut, and slack form. The approximate daily output of the mine when sampled in 1906 was 400 tons daily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 282; Bureau of Mines Bull. 23, pp. 70, 188; washing tests: U. S. Geol. Survey Bull. 332, p. 282; Bull. 336, p. 14.

For chemical analyses see part I of this bulletin, p. 247; also U. S. Geol. Survey Bull. 332, p. 281.

WINIFREDE. GAS MINE.

Sample.—Bituminous coal; Kanawha field; (West Virginia No. 21) analyses Nos. 2377, 2378 (p. 247).

Mine.—Gas, a drift mine in the Kanawha-New River district, at Winifrede, on the Chesapeake & Ohio Railroad.

Coal bed.—Locally known as the Peerless of the West Virginia Geological Survey. It is of Carboniferous age, Kanawha formation. At this mine the bed lies nearly flat and has an average thickness of about 2½ feet. The roof is good, a gray laminated shale at the points where sections were measured. In a part of the mine the coal has a sandstone roof. The floor is a gray laminated shale.

The bed was measured and sampled at two points by J. W. Groves on October 28, 1905, as shown below:

Sections of coal bed in gas mine at Winifrede.

Section	A		B	
Laboratory No	2377		2378	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Hard coal [a]	0	½	..	..
Coal	0	5	0	9
Hard coal	..	..	0	¾
Streak of sulphur	..	..	..	..
Coal	0	6	1	5
Hard coal	0	1	..	..
Coal	0	9	..	..
Sulphur	0	⅛	..	..
Coal	..	11	..	..
Floor, shale.				
Thickness of bed	2	8⅝	2	2¾
Thickness of coal sampled	2	8⅛	2	2¾

[a] Not included in sample.

Section A (sample 2377) was measured in room 12, off left entry 3, 1,400 feet southeast of the drift mouth.

Section B (sample 2378) was measured in room 10, off left entry 1, 800 feet southeast of the drift mouth.

Notes.—The coal from this mine, like that from other mines working the bed, is hard, brittle, and contains streaks of mother coal. The average output of the mine in 1905 was about 200 tons per day and was all shipped in run-of-mine form.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 222; Bureau of Mines Bull. 23, pp. 69, 70, 187; washing tests: U. S. Geol. Survey Bull. 290, p. 224; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 224; Bull. 336, pp. 26, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses see part I of this bulletin, p. 247; also U. S. Geol. Survey Bull. 290, p. 222.

LOGAN COUNTY.

HOLDEN. NO. 3 MINE.

Sample.—Bituminous coal; Big Sandy field; (Ann Arbor No. 13) analyses Nos. 7659, 7658 (p. 247).

Mine.—No. 3; Norfolk & Western district; a drift mine, 1 mile east of Holden, 1 mile up Whitman's Creek Branch of Island Creek.

Coal bed.—Island Creek (No. 2 Gas). Carboniferous age, Kanawha formation Roof, sandy gray shale; floor same, beneath which is considerable fire clay.

The bed was measured and sampled at two points by P. M. Riefkin on March 30, 1909, as described below:

Sections of coal bed in No. 3 mine, 1 mile east of Holden.

Laboratory No.	7659		7658	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandy gray shale.				
Top coal	a 0	4	a 0	6¼
Coal	0	5⅝	..	⅛
Mother coal	..	..	..	..
Splint coal	1	2⅜	..	..
Coal	..	..	0	6
Shale	a 0	3⅜	..	..
Splint coal	..	..	1	2⅜
Coal	0	1	..	..
Shale	..	..	a 0	4¾
Coal	..	..	0	1¾
Splint	0	1 1/16	..	..
Splint	..	..	0	1¾
Coal	0	6¾	..	3½
Splint	1	2	0	3¼
Mother coal	0	1/16	..	..
Coal	1	3¼	0	1¼
Splint	..	..	1	2
Bottom coal	a 0	11½	..	..
Mother coal	..	..	0	1/16
Coal	..	..	1	⅛
Bottom coal	..	..	a 0	6
Floor, shale.				
Thickness of bed	6	5	6	2 11/16
Thickness of coal sampled	4	10⅛	4	9 11/16

a Not included in sample.

Sample 7659 was taken 1,600 feet northeast of opening, in face of left entry 3, off main entry 1.

Sample 7658 was taken 1,900 feet northwest of opening, in face of right entry 1, off main entry.

Notes.—The mine was operated to produce coal for illuminating gas. The roof is strong. Sulphur balls are rather abundant throughout the mine. The daily output was about 300 tons at time of sampling. Output of mine in fiscal year 1910, 150,297 long tons.

For chemical analyses of this coal see part I of this bulletin, p. 247.

McDOWELL COUNTY.

ALGOMA. PINEY MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8321, 8322, 8323, 8324, 8428 (p. 248).

Mine.—Piney; Norfolk & Western district; a drift mine 1 mile from Algoma, on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, about 5¼ feet to 6½ feet; main roof, sandstone underlain with 2 feet of dark-blue shale, between which and the coal there are about 3 inches of "muck" or "draw slate," which tended to become mixed with the coal in loading; floor, hard, blue, shaly underclay with smooth surface.

The bed was measured and sampled at four points on July 20, 1909, by H. M. Wolflin, as described below:

Sections of coal bed in Piney mine, 1 mile from Algoma.

Section	A		B		C		D	
Laboratory No.	8324		8323		8322		8321	
Roof, sandstone, dark blue shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11¾	..	..	..	..	0	10
Bony coal	0	1	..	..	..	..	[a] 0	2
Bright coal (sometimes mother-coal streaks)	1	5½	1	7	1	4	1	4
Bony coal	[a] 0	2	[a] 0	2½	[a] 0	3¼	[a] 0	3¼
Bright coal	1	0	0	10¼	2	2	1	1
Hard gray coal	..	..	0	½	..	..	..	..
Dull waxy coal	1	1½	0	11	..	..	1	9
Soft coal (mother-coal streaks)	1	6½	1	10¾	1	7¼	1	0
Floor, hard shaly underclay.								
Thickness of bed	6	4¼	5	6	5	4½	6	5¼
Thickness of coal sampled	6	2¼	5	3½	5	1¼	6	0

[a] Not included in sample.

Section A (sample 8324) was cut from face of airway off big 4 entry.

Section B (sample 8323) was cut from face of main entry.

Section C (sample 8322) was cut from face of cross air course 6.

Section D (sample 8321) was cut from room 31, off cross entry 4.

A composite sample was made by mixing face samples 8322, 8323, and 8324 for an ultimate analysis, the results of which are shown under laboratory No. 8428.

Notes.—The coal at this mine was undercut in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar and shaking screens with ½-inch, 1¼-inch, and 3-inch openings. The slack was coked in beehive ovens. Of the entire output, about 40 per cent was shipped as run-of-mine coal. The coal was picked on the car by five trimmers. The daily output at time of inspection and sampling in July, 1909, averaged about 600 tons, and 1,350 tons was a maximum day's run. Increase of the output was planned. The future output was to be derived from both advance work and pillars. Output of mine should be considered in connection with that of the Northfork mine.

For chemical analyses of this coal see part I of this bulletin, p. 248.

ANAWALT. ANAWALT MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8643, 8644, 8747 (p. 248).

Mine.—Anawalt; Norfolk & Western district. A drift mine 1 mile northwest of Anawalt, on Tug Fork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 7 feet 9 inches to 9 feet 5 inches; dip, 4° NW.; main roof, tender grayish-blue shale, between which and the coal occurs 3 to 8 inches of draw slate which fell and tended to mix with the coal; hence about 6 inches of the hard bony top coal was left up in many places as the immediate roof; floor, soft clay with smooth surface; cover, for the most part, 40 to 150 feet thick. The bed was measured and sampled at two points by R. Y. Williams on July 31, 1909, as described below:

Sections of coal bed in Anawalt mine, 1 mile northwest of Anawalt.

Section	A		B	
Laboratory No.	8643		8644	
	Ft.	*in.*	*Ft.*	*in.*
Roof, tender grayish blue shale and draw slate.				
Bony and sulphurous "top coal"	[a] 0	6	[a] 0	6
Soft bright coal (mother-coal streaks)	2	6	1	7
Gray coal to bony coal	[a] 0	6	0	2
Soft bright coal (mother-coal streaks)	1	1½	0	6½
Gray coal to bony coal	0	1	[a] 0	5
Soft bright coal (mother-coal streaks)	1	0	0	11
Harder grayish coal	0	6	0	3
Soft bright coal	1	11	4	2
Floor, soft clay, smooth surface.				
Thickness of bed	8	1½	8	6½
Thickness of coal sampled	7	1½	7	7½

[a] Not included in sample.

Section A (sample 8643) was cut from the face of right entry 1, 450 feet from drift mouth.

Section B (sample 8644) was cut from the face of the main entry, 350 feet from drift mouth.

A composite sample was made by mixing samples 8643 and 8644 for an ultimate analysis, the results of which are shown under laboratory No. 8747.

Notes.—The coal at this mine was undercut by hand in bottom part of bed and was shot down with a permissible explosive. The tipple was equipped with bar screens with 4½-inch spaces; most of the coal, however. was shipped in run-of-mine form. This is a coking coal, but there were no ovens at this plant. The coal was picked on car by two trimmers. The daily output averaged 100 tons, and 150 tons was the maximum day's run. The future output for some time to come was to be derived mainly from advance workings, as this was a new mine.

For chemical analyses of this coal see part I of this bulletin, p. 248.

ARLINGTON. ARLINGTON MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8325, 8326, 8363, 8364, 8365, 8418, 8419 (pp. 248, 249).

Mine.—Arlington; Norfolk & Western district; a drift mine at Arlington, on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from about 4¾ feet to 6¼ feet; roof, hard blue shale, between which and the coal there is 3 to 4 inches of draw slate; floor, hard, blue, shaly underclay with smooth surface; cover, for the most part, from 100 to 600 feet thick.

The bed was measured and sampled at five points on June 23, 1909, by J. J. Rutledge and H. M. Wolflin, as described below:

Sections of coal bed in Arlington mine at Arlington.

Section	A		B		C		D		E	
Laboratory No.	8325		8326		8363		8364		8365	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard blue shale and draw slate.										
Sulphurous coal [a]	..	..	..	..	0	2	..	..	..	..
Coal (in places mother-coal streaks)	1	1	1	½	1	1	1	3	1	1
Bone (in places sulphurous) [a]	0	2½	0	2½	0	2½	0	2	0	2
Coal (in places mother-coal streaks)	1	7	1	3¼	1	8½	1	9	1	9
Hard gray coal	0	2¼	0	3½	0	3	0	2	0	3
Coal (in places mother-coal streaks)	2	¼	2	¾	1	9	2	2	1	9¾
Floor, hard, blue, shaly underclay.										
Thickness of bed	5	1	4	10½	5	2	5	6	5	¾
Thickness of coal sampled	4	10½	4	8	4	9½	5	4	4	10¾

[a] Not included in sample.

Section A (sample 8325) was cut from pillar 7, off room 16, off cross entry 10.

Section B (sample 8326) was cut from pillar 7, off cross entry 8.

Section C (sample 8363) was cut from face of main entry.

Section D (sample 8364) was cut from face of cross entry 8, off diagonal entry 1.

Section E (sample 8365) was cut from face of cross entry 12, off Burke's garden entry.

A composite sample was made by mixing face samples Nos. 8363, 8364, and 8365 for an ultimate analysis, the results of which are shown under laboratory No. 8419.

A composite sample was also made by mixing pillar samples Nos. 8325 and 8326 for an ultimate analysis, the results of which are shown under laboratory number 8418.

Notes.—The coal was undercut in the bed entirely by hand, and was shot down with black powder. The tipple was equipped with bar screens with 1½-inch and ⅝-inch spaces. This is a coking coal, and there were in all about 150 ovens at the plant. The coal was picked on the car by six trimmers. The daily output averaged about 700 tons (roughly 45 per cent of which was shipped as run-of-mine coal), and a maximum day's run was about 1,020 tons. The future output was to be principally from advance work. For some time to come not more than 10 to 20 per cent of the total output was to be pillar coal.

For chemical analyses of this coal see part I of this bulletin, pp. 248, 249.

ASHLAND. ASHLAND MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8477, 8478, 8479, 8491, 8492, 8929 (p. 249).

Mine.—Ashland; Norfolk & Western district; a drift mine at Ashland, on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 4½ to 5½ feet; main roof, exceptionally hard gray shale, 15 feet thick, between which and the coal there is from 3 to 5 inches of draw slate, which falls and tends to mix with the coal. The whole is capped with sandstone; floor, hard, blue shaly underclay with smooth surface.

The bed was measured and sampled at five points by J. J. Rutledge and H. M. Wolflin on July 27, 1909, as described below:

Sections of coal bed in Ashland mine at Ashland.

Section	A		B		C		D		E	
Laboratory No	8477		8478		8479		8491		8492	
Roof, shale and "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	¾	1	½	1	0	1	0	1	0
Bony coal [a]	0	3	0	3½	0	4½	0	3	0	3½
Coal	0	6½	2	4½	2	10½	2	8	2	10
Sulphurous coal [a]	..	..	..	..	..	..	..	..	0	½
Mother coal	0	¾	..	..	..	..	..	..	..	..
Coal	2	2½	..	..	..	..	..	..	0	1¾
Sulphur [a]	0	¾	0	¼	0	¾	0	½	0	¼
Coal	0	8	1	½	0	8½	0	7½	0	5¼
Floor, hard, blue, shaly underclay.										
Thickness of bed	4	10¼	4	9¼	5	¼	4	7	4	9¼
Thickness of coal sampled	4	6½	4	5½	4	7	4	3½	4	5

[a] Not included in sample.

Section A (sample 8477) was cut from room 27, off entry 2, off Tadpole entry.

Section B (sample 8478) was cut from room 2, off cross entry 1, off Wheeling entry.

Section C (sample 8479) was cut from room 1, off cross entry 1, off entry 8.

Section D (sample 8491) was cut from room 16, off cross entry 4, off Ohio Big Mountain entry in the St. Louis panel.

Section E (sample 8492) was cut from face of Virginia entry.

A composite sample was made by mixing samples 8477, 8478, 8479, 8491, 8492, 8493, and 8494 for an ultimate analysis, the results of which are shown under laboratory number 8929.

Samples 8493 and 8494 were from the Monitor mine. The two mines are contiguous, have like conditions, and were operated by the same company, and for that reason the samples were mixed for an ultimate analysis.

Notes.—The coal at this mine was partly undercut by hand in bottom part of bed. The coal was shot down with black powder. The tipple was equipped with bar screens with 1½ and 4 inch openings. The coal was picked on the car by eight trimmers. A picking belt was, however, being installed. The plant was equipped with a washer. The daily output in July, 1909, averaged about 600 tons, about 75 per cent of which was shipped as run-of-mine coal; 1,500 tons was a maximum day's run. The output in the immediate future was to be derived from advance work and pillars in about equal proportions. The output of mine should be considered in connection with that of the Monitor mine.

For chemical analyses of this coal see part I of this bulletin, p. 249.

ASHLAND. CHEROKEE MINE.

Sample.—Bituminous coal; Pocahontas field; analyses Nos. 8526, 8527, 8528, 8529, 8679 (p. 249).

Mine.—Cherokee; Norfolk & Western district; a drift mine ½ mile north of Ashland on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, from 4 feet 10 inches to 5 feet 9 inches; main roof, black shale with smooth surface; floor, hard gray shale with good surface; cap rock, sandstone, from 10 to 16 feet above the coal.

The bed was measured and sampled at four points by J. J. Rutledge on July 28, 1909, as described below:

Sections of coal bed in Cherokee mine, ½ mile north of Ashland.

Section	A		B		C		D	
Laboratory No.	8526		8527		8528		8529	
	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Roof, smooth, black shale.								
Coal	1	0	0	11	0	10½	..	..
Bony coal [a]	0	3	0	2½	0	2½	0	3¼
Coal	3	3½	3	2	3	7	3	2½
Black bony and sulphurous coal [a]	0	½	0	½	0	⅛	0	¼
Coal	0	9½	0	7	0	5	0	8
Floor, hard gray underclay.								
Thickness of bed	5	4½	4	11	5	1⅛	4	2
Thickness of coal sampled	5	1	4	8	4	10½	3	10½

[a] Not included in sample.

Section A (sample 8526) was cut from the face of main air course 2.

Section B (sample 8527) was cut from the face of right entry 4, off main entry.

Section C (sample 8528) was cut from the face of left entry 5, off main entry 1.

Section D (sample 8529) was cut from pillar 26 in left entry 2, off main entry 1.

A composite sample was made by mixing samples 8526, 8527, and 8528, for an ultimate analysis, the results of which are shown under laboratory No. 8679.

Notes.—The coal at this mine was undercut by punching machines, and was shot down by black powder. The coal was shipped in run-of-mine form. This is a coking coal but there were no ovens at the mine. The daily output was 600 tons, and 750 tons was a maximum day's run. The future output was to be derived chiefly from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 249.

ASHLAND. MONITOR MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8493, 8494, 8495, 8496, 8929 (pp. 249, 250).

Mine.—Monitor; Norfolk & Western district; a drift mine; 1 mile east of Ashland, on the Norfolk & Western Railway, Norfolk Branch.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness of coal, as mined, from 4⅔ to 5¼ feet; roof, very strong blue shale with smooth undersurface, between which and the coal there is from 5 to 7 inches of "muck" or "draw slate" which tended to mix with the coal in mining; floor, hard shaly underclay with smooth surface.

The bed was measured and sampled at four points on July 28, 1909, as described below:

Sections of coal bed in Monitor mine, 1 mile east of Ashland.

Section	A		B		C		D	
Laboratory No	8493		8494		8495		8496	
Roof, strong blue shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal	0	11	1	0	1	1	1	0
Bony coal [a]	0	3	0	2¼	0	2½	0	2½
Coal (often soft)	..	..	0	3	0	1	..	..
Coal (dull, waxy)	..	..	..	..	0	2½	..	..
Coal (bright, lustrous streaks)	3	4½	..	..	2	6	..	..
Coal (hard)	..	..	3	½	..	..	0	3½
Coal (hard, mother-coal streaks)	..	..	0	2	..	..	2	8½
Bony coal [a]	0	1½	0	1	0	1½	0	2½
Coal (soft, bright)	0	4½	0	10	0	6	0	5¾
Clay parting [a]	0	½	..	..	..	..	..	..
Coal (soft)	0	4½	..	..	..	..	..	..
Floor, hard, blue shaly underclay.								
Thickness of bed	5	5½	5	6¾	4	8½	4	10¾
Thickness of coal sampled	5	½	5	3½	4	4½	4	5¾

[a] Not included in sample.

Section A (sample 8493) was cut from face of Kentucky air course, about 5,500 feet southeast of drift mouth.

Section B (sample 8494) was cut from face of Pennsylvania entry, about 4,800 feet northeast of drift mouth.

Section C (sample 8495) was cut from pillar 20, off cross entry 3, off Pennsylvania entry, Buffalo panel.

Section D (sample 8496) was cut from pillar 15, off cross entry 3, off Kentucky entry, Andrew panel.

A composite sample was made by mixing the face samples 8477, 8478, 8479, 8491, 8492, 8493, and 8494 for an ultimate analysis, the results of which are shown under laboratory No. 8929.

The first five samples were from the Ashland mine. The two mines are contiguous, have like conditions, and were operated by the same company, and for that reason the samples were mixed for an ultimate analysis.

Notes.—The coal at this mine was partly undercut by hand in bottom part of bed, and the coal was shot down with black powder. The daily output in July, 1909, averaged about 700 tons, while 1,000 tons was a maximum day's run. It was claimed that 1,500 tons could be mined with equipment then on hand. The output was to be derived principally from advance work for some time, possibly one-fourth of the total tonnage to be pillar coal. The output of this mine should be considered in connection with that of the Ashland mine.

For chemical analyses of this coal see part I of this bulletin, pp. 249, 250.

BEAR WALLOW. ROANOKE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8700, 8701, 8726, 8727, 8792, 8793 (p. 250).

Mine.—Roanoke; Norfolk & Western district; a drift mine at Bear Wallow (Worth post office), on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness mined, from 5 feet to 5½ feet; roof, massive, hard, blue shale, 8 feet in thickness, between which and the coal there is from 1 to 12 inches of "muck" or "draw slate," which tended to fall and mix with the coal in mining. A cap rock of sandstone lies above the shale; floor, hard, blue, shaly underclay with smooth surface; cover, for the most part, from 200 to 600 feet thick.

The bed was measured and sampled at four points on August 6 and 7, 1909, by H. M. Wolflin, as described below:

Sections of coal bed in Roanoke mine at Bear Wallow.

Section	A		B		C		D	
Laboratory No.	8700		8701		8727		8726	
Roof, massive, hard, blue shale, and "muck" or "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Dirty mother coal	0	1½	..	..	..	..	..	..
Hard bright tough coal	0	11½	1	1½	..	..	..	..
Hard gray coal	..	..	..	..	1	0	..	..
Coal (mother-coal streaks)	..	..	..	..	..	..	1	½
Bony coal[a]	0	3¼	0	1½	0	4	0	4
Bright soft coal	1	7½	..	..	1	1½	..	..
Tough coal (in places mother-coal streaks)	..	..	1	6½	..	..	1	0
Hard gray coal	0	1½	0	2	0	3	0	3
Bright coal (mother-coal streaks)	1	11	2	0	2	4	2	4
Floor, hard, blue, shaly underclay.								
Thickness of bed	5	¼	4	11½	5	½	4	11½
Thickness of coal sampled	4	9	4	10	4	8½	4	7½

[a] Not included in sample.

Section A (sample 8700) was cut from pillar 69, off Klondike entry, about 6,700 feet northeast of drift mouth.

Section B (sample 8701) was cut from face of entry 15, off diagonal entry, off main entry, about 6,200 feet northeast of drift mouth.

Section C (sample 8727) was cut from pillar 19, on cross entry 3, off China entry, about 2,200 feet northeast of drift mouth.

Section D (sample 8726) was cut from face of cross air course 6, off China entry, about 3,600 feet northeast of drift mouth.

A composite sample was made by mixing samples 8700 and 8727 for an ultimate analysis, the results of which are shown under laboratory No. 8793.

A composite sample was also made by mixing samples 8701 and 8726 for an ultimate analysis, the results of which are shown under laboratory No. 8792.

Notes.—The coal at this mine was undercut entirely by hand in the bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with ¼, 1¼, and 3 inch openings. The slack was coked in beehive ovens. Of the entire output, 75 per cent was shipped as run-of-mine coal. The coal was picked on the car by five trimmers. The estimated daily average output was about 700 tons, and 800 tons was a maximum day's run. Plans were well advanced to build a new tipple and install new equipment to increase the capacity to 1,500 tons daily. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 250.

BIG SANDY. BIG SANDY MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 1238 and 1242 (West Virginia No. 12) and analyses Nos. 8826, 8827, 8828, 8829, 8830, 8934 (pp. 250, 251).

Mine.—Big Sandy; Norfolk & Western district; a drift mine at Big Sandy, on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell. The Tug River or No. 8 bed is also worked. Carboniferous age, Sewell formation. Thickness, 1 foot 6 inches to 4 feet 5 inches, the average being about 3 feet 8 inches. It has a hard shale roof which did not fall with the coal. The floor is a hard underclay with a smooth surface. The cover over the coal is from 30 to 800 feet thick.

The bed was measured and sampled at five points by J. W. Groves on August 12, 1909, as described below:

Sections of coal bed in Big Sandy mine at Big Sandy.

Section	A		B		C		D		E	
Laboratory No	8828		8829		8830		8827		8826	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	..	..	..	..	1	7	1	1½	..	..
Bony coal	..	..	..	..	..	..	[a] 0	1½	..	..
Shale	..	..	..	..	[a] 0	2½	[a] 0	1	..	..
Coal	0	4½	..	..	[a] 0	2	1	8½	..	..
Mother coal	0	¼	..	..	..	..	0	1½	..	..
Shale	..	..	..	..	[a] 0	2½	..	..	..	..
Coal	0	6¼	0	10½	1	7	0	8	2	1
Mother coal	0	¼	0	¼	0	¾	..	..	0	½
Coal	1	8	2	8	0	2	..	..	1	6
Mother coal	0	½	..	..	0	1¼	..	..	..	..
Coal	0	6½	..	..	0	4	..	..	..	..
Floor, hard underclay.										
Thickness of bed	3	2¼	3	6¾	4	5	3	10	3	7½
Thickness of coal sampled	3	2¼	3	6¾	3	10	3	7½	3	7½

[a] Not included in sample.

Section A (sample 8828) was cut from the face of right entry 2, off left entry 2, 3,500 feet northeast of the drift mouth.

Section B (sample 8829) was cut from a pillar in cross entry 3, off right entry 1, 1,350 feet southeast of the drift mouth.

Section C (sample 8830) was cut from a pillar on right entry 3, 2,900 feet southeast of the drift mouth.

Section D (sample 8827) was cut from the face of the main entry, 5,000 feet southeast of the drift mouth.

Section E (sample 8826) was cut from the face of left entry 13, 3,500 feet east of the drift mouth.

A composite sample was made by mixing the face samples 8826, 8827, and 8828 for an ultimate analysis, the results of which are shown under laboratory No. 8934.

The No. 8 or Tug River bed was measured and sampled by J. S. Burrows on October 12, 1904, at two points.

Section A (sample 1238) was taken in the face of right entry 3, where the coal was 3 feet 4 inches thick.

Section B (sample 1242) was taken at the face of right entry 5, where the coal was 3 feet 7 inches thick.

Notes.—The coal at this mine was undercut with hand picks and electric chain machines, and was shot down with black powder. The tipple building had shaker screens with openings as follows: Oblong holes, 5 by 3½ inches, 2½ by 1½ inches, 1½ by ¾ inches and round holes, $\frac{15}{16}$ inch in diameter. The capacity of the mine was 750 tons, the output being 450 tons daily. The mine was expected to produce about 50 per cent from advance work and 50 per cent from pillars. The slack and nut combined were 71 per cent; egg, 14 per cent; and lump, 15 per cent of the output. The slack was used largely for making coke in by-product ovens.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 913; Bull. 261, p. 83; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1291; Bull. 261, p. 114; Bureau of Mines Bull. 13, pp. 219,276; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1473; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1366; Bull. 261, p. 129; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1387.

For chemical analyses see part I of this bulletin, pp. 250, 251; also U. S. Geol. Survey Prof. Paper 48, p. 260; Bull. 261, p. 58.

CARRETTA. CARRETTA MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8630, 8631, 8632, 8696 (p. 251).

Mine.—Carretta; Norfolk & Western district; a drift mine, at Carretta on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Thickness, as mined, from 2 to 6 feet; roof, hard clay, 5 feet in thickness, underlain with 2 inches of carbonaceous clay and capped with sandstone; the carbonaceous clay to some extent fell with the coal; floor, hard clay with smooth surface.

The bed was measured and sampled at three points by C. A. Fisher, July 28, 1909, as described below:

Sections of coal in Carretta mine, at Carretta.

Section	A		B		C	
Laboratory No	8630		8631		8632	
Roof, hard clay, and carbonaceous clay.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal (mother-coal streaks)	0	9½	..	..	..	..
Firm coal (mother-coal streaks)	1	11½	4	1	1	0
Hard bony coal [a]	0	½	..	..	..	..
Mother coal	..	..	..	..	0	½
Coal (mother-coal streaks)	1	0	..	..	3	1
Floor, hard dark clay.						
Thickness of bed	3	9½	4	1	4	1½
Thickness of coal sampled	3	9	4	1	4	1½

[a] Not included in sample.

Section A (sample 8630) was cut from the face of the main butt west entry.

Section B (sample 8631) was cut from the face of the main butt east entry, 1,000 feet feet from drift mouth.

Section C (sample 8632) was cut from the face of the main south entry, 1,100 feet from drift mouth.

A composite sample was made by mixing samples 8630, 8631, and 8632 for an ultimate analysis, the results of which are shown under laboratory No. 8696.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with a short-flame explosive or black powder. The tipple had bar screens, with ¾-inch and 4-inch spaces, but in July, 1909, the entire output was shipped as run-of-mine coal. The coal was picked on car by one trimmer. This is a coking coal, but there were no ovens at this plant. The daily output averaged 150 tons, the rated capacity being 300 tons. The future output for some time to come was to be derived mainly from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 251.

COALWOOD. COALWOOD MINES NOS. 1, 2, and 4.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8503, 8504, 8505, 8593, 8652, 8653, 8654, 8697, 8663, 8664, 8665, 8698 (p. 251).

Mines.—Coalwood Nos. 1, 2, and 4, mines; Norfolk & Western district; drift mines at Coalwood, on the Norfolk & Western Railway.

Coal bed.—Locally termed the Welch. Carboniferous age, Sewell formation. Thickness, variable, ranging, as mined, from 3 feet to 7 feet; dip, gentle, to the northwest; roof, strong sandstone, at many places underlain with a hard clay shale which rarely fell with the coal; floor, hard sandstone with smooth surface.

The bed was measured and sampled at nine points by C. A. Fisher, on July 27 and 29, 1909, as described on the following page.

Sections of coal bed in Coalwood No. 1 mine at Coalwood.

Section	A		B		C	
Laboratory No	8503		8504		8505	
Roof, top coal and hard sandy shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	11	1	1	0	5
Graphitic earthy coal	..	..	[a] 0	1	[a] 0	1
Impure grayish coal	[a] 0	3	0	5	0	4
Bright coal	2	5	3	2	3	9
Hard dark bone	[a] 0	1	..	..	..	..
Hard coal	0	9	..	..	..	..
Floor, hard sandstone.						
Thickness of bed	4	5	4	9	4	7
Thickness of coal sampled	4	1	4	8	4	6

[a] Not included in sample.

Section A (sample 8503) was cut from the face of room 2 on entry 4.

Section B (sample 8504) was cut from the face of room 17 on cross entry 4.

Section C (sample 8505) was cut from the face of room 2 on cross entry 8.

A composite sample was made by mixing samples 8503, 8504, and 8505 for an ultimate analysis, the results of which are shown under laboratory No. 8593.

Sections of coal bed in Coalwood No. 2 mine, ½ mile northwest of Coalwood.

Section	A		B		C	
Laboratory No	8654		8653		8652	
Roof, clay shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	10	1	0	1	0
Bone [a]	0	2½	0	4	0	1
Gray bony coal	..	..	..	..	0	3
Bright coal	2	9	1	11	2	4
Bright coal (sulphur impurities) [a]	0	9	0	8	..	..
Floor, hard sandstone						
Thickness of bed	4	6½	3	11	3	8
Thickness of coal sampled	3	7	2	11	3	7

[a] Not included in sample.

Section A (sample 8654) was cut from the face of heading 7, off the main entry.

Section B (sample 8653) was cut from the face of right butt entry 1, off the east main entry.

Section C (sample 8652) was cut from the face of room 6 on right heading 1, off the west main entry.

A composite sample was made by mixing samples 8652, 8653, and 8654 for an ultimate analysis, the results of which are shown under laboratory No. 8697.

Sections of coal bed in Coalwood No. 4 mine at Coalwood.

Section	A		B		C	
Laboratory No	8665		8664		8663	
Roof, hard clay shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	11	1	0	0	8
Bone or grayish coal [a]	0	4½	0	5	0	1
Bony coal	..	..	..	..	0	4
Bright coal	3	0	3	7	2	1
Bone [a]	..	..	..	..	0	1
Coal	..	..	..	..	0	4
Floor, hard sandstone.						
Thickness of bed	4	3½	5	0	3	7
Thickness of coal sampled	3	11	4	7	3	5

[a] Not included in sample.

Section A (sample 8665) was cut from the face of right entry 4.

Section B (sample 8664) was cut from the face of room 15 on the main air course.

Section C (sample 8663) was cut from the face of right entry 12.

A composite sample was made by mixing samples 8663, 8664, and 8665 for an ultimate analysis, the results of which are shown under laboratory number 8698.

Notes.—The coal was undercut by hand in bottom part of bed, and was shot down with a short-flame explosive or black powder. The three Coalwood mines had a central boiler plant, but each mine had a separate tipple. The tipples were being equipped with screens, but at time of sampling in 1909 the entire output was shipped as run-of-mine coal. This is a coking coal, but there were no ovens at this plant. The coal was picked on car by one or two trimmers at each tipple. The daily output of this plant averaged 900 tons, and about 1,400 tons was the maximum day's run. The future output was to be derived from advance work and from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 251.

CRUMPLER. ZENITH MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8645, 8646, 8692, 8693, 8724 (p. 252).

Mine.—Zenith; Norfolk & Western district; a drift mine at Crumpler on the Norfolk branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pottsville formation. Thickness, as mined, from 4 to 4¾ feet; roof, strong blue shale (about 5 feet in thickness), between which and the coal there is 3 to 4 inches of "muck" or "draw slate." There is a cap rock of sandstone. Some of the "draw" slate was liable to be mixed with the coal in loading. Floor, hard shaly underclay, with smooth surface.

The bed was measured and sampled at four points on August 3, 1909, by J. J. Rutledge and H. M. Wolflin, as described below:

Sections of coal bed in Zenith mine at Crumpler.

Section	A		B		C		D	
Laboratory No	8645		8646		8692		8693	
Roof, dark, hard shale, and "muck" or "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Vitreous coal (cubical cleavage) [a]	..	..	..	..	0	¾	..	..
Coal (usually hard and bright)	1	2½	1	1½	1	1½	1	2
Bony coal [a]	0	2½	0	2½	0	2	0	3
Bright coal (mother-coal streaks)	..	..	..	..	2	3½	3	1
Coal	2	4½	2	8½	..	..	..	..
Sulphurous bony coal [a]	0	½	0	½	0	½	..	..
Soft bright coal (mother-coal streaks)	..	..	..	..	0	5½	..	..
Coal	0	6¾	0	7½	..	..	..	..
Floor, hard, gray, shaly underclay.								
Thickness of bed	4	4¾	4	8½	4	1¾	4	6
Thickness of coal sampled	4	1¾	4	5½	3	10½	4	3

[a] Not included in sample.

Section A (sample 8645) was cut from face of Texas heading 2, about 3,600 feet east of drift mouth.

Section B (sample 8646) was cut from room 20, off right entry 1, off main entry, about 2,700 feet southeast of drift mouth.

Section C (sample 8692) was cut from face of Pennsylvania entry, about 3,150 feet northeast of drift mouth.

Section D (sample 8693) was cut from face of Wisconsin air course, about 3,000 feet northwest of drift mouth.

A composite sample was made by mixing samples Nos. 8645, 8646, 9692, and 8693 for an ultimate analysis, the results of which are shown under laboratory number 8724.

Notes.—The coal was undercut, in bottom part of bed, entirely by hand, and was shot down with black blasting powder. The tipple was equipped with bar screens with 2½-inch openings. These, however, were not in use at time of sampling, the entire output being shipped as run-of-mine coal. Foundations were being laid for a large new tipple and coal washer. The coal was picked on the car by eight trimmers. The daily output at time of sampling in 1909 averaged 500 tons, 800 tons being a maximum day's run. Output was to be greatly increased and was to come almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 252.

DAVY (HALLSVILLE POST OFFICE). BLACKSTONE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 5276, 5277 (Jamestown No. 3), and analyses Nos. 8513, 8514, 8515, 8516, 8517, 8589, 8590 (pp. 252, 253).

Mine.—Blackstone; Norfolk & Western district; a drift mine ¼ mile southeast of Davy (Hallsville post office), on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell or Thin Vein. The coal is of Carboniferous age, Sewell formation. The thickness of bed ranges from 3 to 4½ feet; the roof is hard blue shale with smooth surface; the floor is a hard smooth shale; there is a cap rock of sandstone, about 8 feet thick.

The bed was measured and sampled at five poins by A. C. Ramsay on July 29, 1909, as described below:

Sections of coal bed in Blackstone mine, ¼ mile southeast of Davy.

Section	A		B		C		D		E	
Laboratory No.	8513		8514		8516		8517		8515	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard shale.										
Soft bright coal (mother-coal streaks)	3	1¼	..	..	1	1¼	1	1½	0	11
Soft bright coal	..	..	0	11¾	..	..	..	..	..	..
Bony coal[a]	0	¼	0	¾	0	¾	0	¾	0	¾
Soft bright coal	0	8	1	2	0	4	..	..	..	..
Soft bright coal (mother-coal streaks)	..	..	1	2	..	..	1	10¼	1	7¼
Medium hard bright coal	..	..	..	..	0	4	..	..	..	..
Soft bright coal	..	..	..	..	1	10	..	..	..	..
Floor, hard, smooth shale.										
Thickness of bed	3	9½	3	4½	3	8	3	½	2	7
Thickness of coal sampled	3	9¼	3	3¾	3	7¼	2	11¾	2	6¼

[a] Not included in sample.

Section A (sample 8513) was cut from the face of left entry 16, 3,700 feet from the drift mouth.

Section B (sample 8514) was cut from the face of right entry 3, off cross entry 4, off right entry 6, 3,650 feet from drift mouth.

Section C (sample 8516) was cut from pillar of room 5 on right entry 1, off cross entry 4, off right entry 6, 3,000 feet from drift mouth.

Section D (sample 8517) was cut from pillar in room 15 on left entry 8, 2,550 feet from drift mouth.

Section E (sample 8515) was cut from the face of left entry 8, 3,650 feet from drift mouth.

Two composite samples were made, one by mixing samples 8513, 8514, and 8515, the other by mixing samples 8516 and 8517, for ultimate analyses, the results of which are shown under laboratory Nos. 8590 and 8589, respectively.

The bed was also measured and sampled at two points in the mine by K. M. Way on August 13, 1907, as shown below:

Sections of coal bed in Blackstone mine, ¼ mile southeast of Davy.

Section	A		B	
Laboratory No.	5276		5277	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	2	1	0	10¾
Mother coal	0	¼	0	⅛
Coal	0	7	..	..
Mother coal[a]	0	⅜	..	..
Bony coal[a]	..	..	0	1
Coal	0	5½	1	10¼
Mother coal and sulphur[a]	0	¼	0	¾
Coal	0	6	0	6
Floor, shale.				
Thickness of bed	3	8⅜	3	4⅞
Thickness of coal sampled	3	8	3	3⅛

[a] Not included in sample.

Section A (sample 5276) was measured in the face of the main entry, 3,000 feet south of the drift mouth.

Section B (sample 5277) was measured in the face of right entry 7, 2,400 feet west of the drift mouth.

Notes.—The coal at this mine was undercut by hand in the bottom part of the bed, and was shot down with black powder. The plant was equipped with bar screens with ¾-inch openings, but all coal was shipped in run-of-mine form. The coal was picked on car and chute by two trimmers. The daily output averaged 600 tons, and the maximum day's run was 960 tons. Sixty per cent of the future output was to be derived from advance workings, and 40 per cent from pillars. There was approximately 180 acres of unmined area yet to be taken out from the opening. The coal, like that from other mines in the field, is a noted steam and coking coal, and is classed as a smokeless coal. The output of the mine in 1909 was consumed chiefly at various manufacturing points along the Atlantic seaboard and by seagoing vessels.

For results of briquetting tests of this coal see U. S. Geol. Survey Bull. 385, p. 17.

For chemical analyses of this coal see part I of this bulletin, pp. 252, 253; also U. S. Geol. Survey Bull. 362, p. 11.

DAVY. No. 1 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 4288 and 4289 (West Virginia No. 26) (p. 253).

Mine.—No. 1 (or Blackstone); Norfolk & Western district; a drift mine in the Low Vein Pocahontas district at Davy (Hallsville post office), on the Norfolk & Western Railway.

Coal bed.—Davy. Carboniferous age, Sewell formation. At this mine the bed lies nearly flat and averages about 3 feet 6 inches thick. The roof is a gray laminated shale. The floor is also shale. Both floor and roof are good.

The bed was measured and sampled at two points in the mine by A. K. Adams and J. W. Groves on December 6, 1906, as shown below:

Sections of coal bed in No. 1 mine at Davy.

Section	A		B	
Laboratory No.	4289		4288	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	1	..	..
Bone	0	½	[a]0	½
Coal	1	6	[a]0	1
Bone	..	..	[a]0	½
Mother coal	0	⅛	..	..
Coal	1	½	0	10
Mother coal	..	..	0	½
Coal	..	..	1	5
Mother coal	..	..	0	¼
Coal	..	..	0	10½
Bone	..	..	[a]0	½
Floor, shale.				
Thickness of bed	3	8⅛	3	4¾
Thickness of coal sampled	3	8⅛	3	2¼

[a] Not included in sample.

Section A (sample 4289) was measured in room 2 on left entry 12, 9,700 feet south of the drift mouth.

Section B (sample 4288) was measured in room 3 on right entry 6, 1,200 feet southwest of the drift mouth.

Notes.—The coal from this mine, like that from other mines in this district, was largely sold for steam production and was used by manufacturing plants, railroads, and ocean-going vessels. It was shipped chiefly to tidewater points.

For chemical analyses of this coal, see part I of this bulletin, p. 253.

DAVY. HELENA AND (NEW) DAVY CROCKETT MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8628, 8629, 8748, 8625, 8626, 8627, 8746 (pp. 253, 254).

Mines.—Helena and (New) Davy Crockett; Norfolk & Western district; drift mines, respectively, ½ mile and 1 mile north of Davy, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness is fairly uniform, ranging as mined from 3 to 3½ feet. The roof is a hard blue shale with a smooth surface. There is a cap rock of sandstone about 10 feet above the coal. The floor is a hard shale. The roof and floor did not get mixed with the coal in mining.

The bed was measured at two points in the Helena mine and at three points in the Davy Crockett mine by A. C. Ramsay on July 30, 1909, as described below:

Sections of coal bed in Helena mine, ½ mile north of Davy.

Section	A		B	
Laboratory No.	8628		8629	
	Ft.	*in.*	*Ft.*	*in.*
Roof, hard blue shale.				
Soft bright coal (mother-coal streaks)	1	1	1	0
Bony coal[a]	0	¾	0	1¼
Soft bright coal (mother-coal streaks)	1	8¾	1	8
Floor, hard underclay smooth surface.				
Thickness of bed	2	10½	2	9¼
Thickness of coal sampled	2	9¾	2	8

[a] Not included in sample.

Section A (sample 8628) was cut from the face of right entry 1, off left entry 1, 600 feet from drift mouth.

Section B (sample 8629) was cut from the face of main entry, 1,200 feet from drift mouth.

A composite sample was made by mixing samples 8628 and 8629 for an ultimate analysis, the results of which are shown under laboratory No. 8748.

Sections of coal bed in (New) Davy Crockett mine, 1 mile north of Davy.

Section	A		B		C	
Laboratory No.	8625		8626		8627	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard blue shale.						
Soft bright coal (mother-coal streaks)	1	1¾	1	1¾	1	1
Bony coal[a]	0	1¼	0	1¼	0	1
Soft bright coal (mother-coal streaks)	1	10¼	1	11½	1	9¾
Floor, hard underclay, smooth surface.						
Thickness of bed	3	1¼	3	2½	2	11¾
Thickness of coal sampled	3	0	3	1¼	2	10¾

[a] Not included in sample.

Section A (sample 8625) was cut from the face of crosscut 3, left entry 1, drift 2, 1,100 feet from drift mouth.

Section B (sample 8626) was cut from face of right entry 14, drift 1, 1,850 feet from drift mouth.

Section C (sample 8627) was cut from face of right entry 7, drift 1, 1,450 feet from drift mouth.

A composite sample was made by mixing samples 8625, 8626, and 8627 for an ultimate analysis, the results of which are shown under laboratory No. 8746.

Notes.—The coal at these mines was undercut by hand at bottom part of bed and was shot down with black powder. The tipple was equipped with bar screens with 2½-inch openings, which made screenings equal to 20 per cent of the output. Coal was picked on a picking belt and on the cars, two trimmers, in 1909, doing this work. The capacity of the Helena mine in July, 1909, was 160 tons a day, the actual output being 100 tons. Its capacity was ultimately to be 500 tons. The mine had 1,600 acres to work out. The near future output was all to be derived from advance work. The capacity of the Davy Crockett (New) mine was 300 tons, and the maximum day's run was 381 tons. The capacity was ultimately to be 500 tons, 70 per cent being derived from advance work and 30 per cent from pillars. There were 1,300 acres of unmined area remaining in 1909.

For chemical analyses of this coal, see part I of this bulletin, pp. 253, 254.

DAVY. CLETUS MINE.

Sample.—Bituminous coal; Tug River field; analyses Nos. 8511, 8512, 8591 (p. 254).

Mine.—Cletus; Norfolk & Western district; a drift mine, 1½ miles southeast of Davy, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Davy (equivalent to the Sewell). Carboniferous age, Sewell formation. Thickness of coal, as mined, from 2 feet 11 inches to 3 feet 8 inches; roof, strong blue shale, about 8 feet thick, capped with sandstone; floor, hard underclay with smooth surface; cover averages 400 feet thick.

The bed was measured and sampled at two points by A. C. Ramsay on July 28, 1909, as described below:

Sections of coal bed in Cletus mine, 1½ miles southeast of Davy.

Section	A		B	
Laboratory No.	8511		8512	
Roof, strong, blue shale.	*Ft.*	*in.*	*Ft.*	*in.*
Soft, bright coal (mother-coal streaks)	1	2¾	1	2½
Bony coal[a]	0	¾	0	1¾
Soft, bright coal (mother-coal streaks)	0	9	1	8¼
Bony coal[a]	..	..	0	¾
Soft, bright coal (mother-coal streaks)	0	11	0	1¾
Floor, hard underclay.				
Thickness of bed	2	11½	3	3
Thickness of coal sampled	2	10¾	3	½

[a] Not included in sample.

Section A (sample 8511) was cut from the face of main drift 2, 1,000 feet from drift mouth.

Section B (sample 8512) was cut from the face of main drift 1, 800 feet from drift mouth.

A composite sample was made by mixing samples 8511 and 8512 for an ultimate analysis, the results of which are shown under laboratory No. 8591.

Notes.—The coal at this mine was undercut in the bottom part of bed and was shot down with black powder. Although in July, 1909, the tipple was equipped with 1¼ and 2½ inch screens the coal was then shipped in run-of-mine form. The daily output averaged 100 tons, this mine being at that time practically new. The future output was to be derived chiefly from advance work.

For chemical analyses of this coal, see part I of this bulletin, p. 254.

DEARING. BLACK WOLF MINE.

Sample.—Bituminous coal; Pocahontas field; analyses Nos. 8518, 8519, 8520, 8594 (p. 254).

Mine.—Black Wolf; Norfolk & Western district; a drift mine, at Dearing, on the Tug Fork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 4. Carboniferous age, Clark formation. Thickness, as mined, from 6 feet to 7 feet 6 inches; roof varies in different sections from a clay shale to a "soapstone;" it did not fall in the rooms, but stuck to the coal; it has a cap rock 15 feet above; floor, rather soft shaly underclay with somewhat rough surface; cover, for the most part, 250 feet thick.

The bed was measured and sampled at three points by R. Y. Williams on July 29, 1909, as described below:

Sections of coal bed in Black Wolf mine at Dearing.

	A		B		C	
Laboratory No	8518		8519		8520	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, "soapstone" or shale.						
Soft bright coal (mother-coal streaks)	1	1	2	5½	2	7
Slightly gray coal	0	1	..	..	..	..
Soft bright coal (mother-coal streaks)	1	5	..	..	..	..
Slate	[a] 0	4	[a] 0	2	[a] 0	4
Bright tough coal	0	8	0	7	..	7½
Bone	[a] 0	5	[a] 0	3	[a] 0	3½
Soft bright coal (mother-coal streaks)	1	½	1	2	1	3
Shale	[a] 0	3	[a] 0	3	[a] 0	2
Soft bright coal	1	1	0	9½	0	11½
Floor, rather soft shaly underclay.						
Thickness of bed	6	4½	5	8	6	2½
Thickness of coal sampled	5	4½	5	0	5	5

[a] Not included in sample.

Section A (sample 8518) was cut from the face of right air course 3, 1,200 feet from drift mouth.

Section B (sample 8519) was cut from the face of the Roanoke entry, 1,200 feet from drift mouth.

Section C (sample 8520) was cut from the face of the Lynchburg entry, 1,200 feet from drift mouth.

A composite sample was made by mixing samples 8518, 8519, and 8520 for an ultimate analysis, the results of which are shown under laboratory No. 8594.

Notes.—The coal was undercut by chain machines in bottom part of bed, and was shot down with black powder or a short-flame explosive. Entire output of mine was shipped as run-of-mine. It was picked both on belt and on car by four trimmers. The daily output averaged 375 tons, and 450 tons was the maximum day's run. It was planned to increase the production to 1,000 tons a day. The output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 254.

EAST VIVIAN. PEERLESS MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8572, 8580, 8753, 8754, 8755, 8756, 8849 (pp. 254, 255).

Mine.—Peerless; Norfolk & Western district; a drift mine at East Vivian on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 5¾ to 6½ feet; roof, gray (kettle-bottom) shale, 2½ feet in thickness, capped by sandstone; floor, hard blue shaly underclay with smooth surface.

The bed was measured and sampled at two points on August 2, 1909, by J. J. Rutledge and H. M. Wolflin, and at four points on August 12, 1909, by H. M. Wolflin, as described on the following page.

Sections of coal bed in Peerless mine at East Vivian.

Section	A		B		C		D		E		F	
Laboratory No	8572		8753		8754		8755		8756		8580	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	..	..	..	..	..	..	..	..	..	..	1	11½
Coal, hard, mottled	0	10	0	11	..	..	0	10½	1	10	..	..
Coal, soft (mother-coal streaks)	..	..	..	..	0	9½	..	..	..	..	..	..
Coal, hard, gray	0	2½	0	2	0	2½	0	1	0	2½	..	..
Coal, hard, mottled	0	10	..	..	..	..	..	..	..	..	..	..
Coal, tough (mother-coal streaks)	..	..	1	1	..	..	..	..	..	..	..	..
Coal, soft (mother-coal streaks)	..	..	..	..	0	8½	..	..	..	..	..	..
Coal, mottled	..	..	..	..	..	..	0	8½	..	..	..	..
Bony coal [a]	0	4	0	3	0	5½	0	6½	0	2	0	3
Coal, soft, mottled (mother-coal streaks)	..	..	..	..	1	0	..	..	1	0	..	..
Coal, soft, mottled	..	..	..	..	..	..	1	0	..	..	..	..
Coal, tough, mottled	1	1	1	1	..	..	..	..	..	..	..	..
Coal, hard, gray	0	1½	0	3	0	2	0	1½	0	1½	..	..
Coal, mottled	0	7	0	4	..	..	0	5	0	6	..	..
Coal, soft, mottled (mother-coal streaks)	..	..	..	..	0	5	..	..	..	..	..	..
Coal, hard, gray	0	9½	1	0	0	10	0	9	0	11	..	..
Coal, soft, bright (mother-coal streaks)	1	6½	1	5½	1	6½	1	6	1	6¼	..	..
Coal	..	..	..	..	..	..	..	..	..	..	3	7¾
Floor, hard, blue, shaly underclay.												
Thickness of bed	6	4	6	6½	6	1½	6	0	6	3¼	5	10¼
Thickness of coal sampled	6	0	6	3½	5	8	5	5½	6	1¼	5	7¼

[a] Not included in sample.

Section A (sample 8572) was cut from face of air course of entry 18, off entry 10.

Section B (sample 8753) was cut from face of air course 28, off entry 10.

Section C (sample 8754) was cut from pillar 16, off entry 22, east side.

Section D (sample 8755) was cut from face of entry 4 on east side.

Section E (sample 8756) was cut from break-through off room 53, off entry 67, off entry 8.

Section F (sample 8580) was cut from last break-through in entry 1.

A composite sample was made by mixing samples 8572, 8580, 8753, and 8755 for an ultimate analysis, the results of which are shown under laboratory No. 8849.

Notes.—The coal was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with 1½ and 3½ inch openings, and with shaker screens with ¼ and ½ inch openings. The screenings were coked in beehive ovens. Of the entire output about 50 per cent was shipped as run-of-mine coal. The coal was picked on the car by four trimmers. The daily output at time of sampling in 1909 averaged about 800 tons, while 1,200 tons was a maximum day's run. Considerably more than half (about two-thirds) of the tonnage of the immediate future was to come from advance work.

For chemical analyses of this coal see part I of this bulletin, pp. 254, 255.

ECKMAN. SHAWNEE MINE.

Sample.—Semibituminous coal, Pocahontas field; analyses Nos. 8772, 8773, 8774, 8775, 8784, 8842 (p. 255).

Mine.—Shawnee; Norfolk and Western district; a drift mine, at Eckman, on the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 6¼ to 7¼ feet; roof, hard gray clay (locally shaly) about 10 feet in thickness, capped by sandstone; floor, hard shaly underclay with smooth surface.

The bed was measured and sampled at five points on August 10, 1909, and August 11, 1909, by H. M. Wolflin, as described below:

Sections of coal bed in Shawnee mine at Eckman.

Section	A		B		C		D		E	
Laboratory No	8784		8775		8774		8773		8772	
Roof, gray "kettle-bottom" shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright tough coal	0	3¼	0	1¾	0	2¼	0	11	0	2
Sulphurous bone coal[a]	0	2½	0	1¼	0	1	..	..	0	1
Tough bright coal (mother-coal streaks)	..	..	..	..	0	11	..	..	2	4
Tough bright coal	2	1	0	11½	..	..	..	..	..	..
Hard gray coal	..	..	0	3	0	2	0	2	..	..
Bright coal (in places mother-coal streaks)	..	..	0	9	0	10	1	2	..	..
Dull bony coal	..	..	..	..	0	2	..	..	..	..
Hard gray coal	..	..	0	3	..	..	..	..	..	..
Bony coal[a]	0	3	0	2	0	3½	0	2½	0	2½
Bright coal (in places mother-coal streaks)	0	8½	1	1½	1	1¾	1	6	1	½
Mother coal (dirty)	0	¾	..	..	..	..	..	..	..	..
Hard gray coal	..	..	..	1	0	1¼	0	6	0	1½
Bright coal (in places mother-coal streaks)	0	2½	0	5	0	5½	..	..	0	6
Mother coal (dirty)	0	½	..	..	..	..	..	..	..	..
Dull coal (streaks of hard gray coal)	1	7½	..	..	..	..	..	..	..	..
Hard gray coal	..	..	0	3	0	10¼	..	..	0	4
Soft coal (mother-coal streaks)	1	6	2	2	1	5½	1	10½	1	11½
Floor, hard, blue, shaly underclay.										
Thickness of bed	6	11½	6	8	6	8	6	4	6	9
Thickness of coal sampled	6	6	6	4¾	6	3½	6	1½	6	5½

[a] Not included in sample.

Section A (sample 8784) was cut from face of entry 2, off entry 17, off main entry, about 4,800 feet south of drift mouth.

Section B (sample 8775) was cut from room 13, off Blue Ridge entry, about 5,400 feet southwest of drift mouth.

Section C (sample 8774) was cut from face of right entry 2, off entry 22, off main entry, about 6,200 feet southwest of drift mouth.

Section D (sample 8773) was cut from room 50, off entry 13, about 7,200 feet southwest of drift mouth.

Section E (sample 8772) was cut from room 15 (up from entry 22) off main entry 2, about 6,700 feet southwest of drift mouth.

A composite sample was made by mixing samples Nos. 8772, 8773, 8774, 8775, and 8784 for an ultimate analysis, the results of which are shown under laboratory No. 8842.

Notes.—The coal at this mine was undercut in bottom part of bed entirely by hand, and was shot down with black blasting powder. The tipple was equipped with bar screens with ½-inch and 3½-inch openings. The slack was coked in beehive ovens. Of the entire output about 90 per cent was shipped as run-of-mine coal. The coal was picked on the car by five trimmers. The daily output averaged about 850 tons, and 1,700 tons was a maximum day's run. It was planned to build a new tipple, and increase the output. Tonnage was to be derived almost entirely from advance work for some time.

For chemical analyses of this coal see part I of this bulletin, p. 255.

ECKMAN. PULASKI NO. 1 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 9010, 9011, 9036 (p. 255).

Mine.—Pulaski No. 1; Norfolk & Western district; a drift mine, ¼ mile south of Eckman, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The coal varies in thickness from 5½ to 7½ feet, has a hard blue shale. roof, with a smooth surface, allowing the coal to part from it readily. The floor is an underclay which is hard in some places and in others soft. It has a smooth surface and did not get mixed with the coal.

The bed was measured and sampled at two points by A. C. Ramsay, on August 11, 1909, as described below:

Sections of coal bed in Pulaski No. 1 mine, ¼ mile south of Eckman.

Section	A		B	
Laboratory No	9010		9011	
Roof, hard, shale.	Ft.	in.	Ft.	in.
Coal	0	4	..	..
Bony coal	[a] 0	1½	..	..
Coal (mother-coal streaks)	1	9½	2	0
Bony coal	[a] 0	1½	[a] 0	1¾
Coal (hard)	0	4½	0	4
Coal (mother-coal streaks)	1	4	1	10
Coal (hard)	..	..	0	6
Coal (gray)	0	1	..	..
Coal (mother-coal partings)	2	6	1	10½
Floor, underclay.				
Thickness of bed	6	8	6	8¼
Thickness of coal sampled	6	5	6	6½

[a] Not included in sample.

Section A (sample 9010) was cut from the pillar of the main entry, 1,000 feet from the drift mouth.

Section B (sample 9011) was cut from the pillar of entry 2½, off cross entry 1, off main entry, 1,500 feet from the drift mouth.

A composite sample was made by mixing the pillar samples 9010 and 9011 for an ultimate analysis, the results of which are shown under laboratory No. 9036.

Notes.—The coal at this mine was undercut with hand picks and was shot down with black powder. The tipple was equipped with bar screens with 1¼-inch spaces and with revolving screens with 4-inch, 3-inch, and 1½-inch holes. The coal was cleaned by seven trimmers as it was loaded on the cars. The combined output at time of inspection and sampling in 1909 was 1,050 tons and the capacity was 1,500 tons. The output was then obtained wholly from pillars and promised gradually to decrease. The coal was loaded from the same tipple as that from the Pulaski No. 2 mine. The output of mine should be considered in connection with that of the Pulaski No. 2 mine.

For chemical analyses of this coal see part I of this bulletin, p. 255.

ECKMAN. PULASKI NO. 2 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 9302, 9303, 9304, 9305, 9306, 9307, 9469, 10093, 10094, 10095, 10096, 10097, 10098, 10104 (p. 255).

Mine.—Pulaski No. 2; Norfolk and Western district, 1 mile southeast of Eckman.

Coal bed.—Pocahontas No. 3. Carboniferous age, Pocahontas formation. Roof, hard blue shale; floor, hard smooth underclay. The bed is from 5½ feet to 7 feet thick, with several partings. The samples were dry when taken.

The bed was measured and sampled at six points on November 5 and 6, 1909, by A. C. Ramsay, as described below:

Sections of coal bed in Pulaski No. 2 mine, 1 mile southeast of Eckman.

Laboratory No	9302		9303		9304		9305		9306		9307	
Roof, blue shale.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
Soft coal	0	8½	0	7	2	6	2	5	0	7	0	7
Bony coal	[a] 0	1½	..	..	[a] 0	2½	[a] 0	¾	[a] 0	2	[a] 0	¾
Sulphur	..	..	[a] 0	1½	..	..	..	..	..	..	..	..
Soft coal	0	9	1	11	0	6½	1	8	3	0	1	11
Hard gray coal	0	4	..	..	..	..	1	0	1	3	..	..
Bony coal	..	..	[a] 0	1¾	..	..	..	..	..	..	0	2
Mother coal	..	..	..	..	0	¾	..	..	..	..	..	..
Soft coal	0	7½	..	..	..	..	..	..	..	..	..	..
Bony coal	[a] 0	1¾	..	..	..	..	..	..	..	..	..	..
Hard gray coal	0	5	..	..	..	..	..	..	..	..	..	..
Soft coal	1	1¼	1	0	0	8	1	6½	1	6	2	9¾
Hard gray coal	0	1	1	1	1	1	..	..	..	..	..	..
Soft coal	2	8¾	1	7	1	3¾	..	..	..	..	..	..
Floor, underclay.												
Thickness of bed	7	¼	6	5¼	6	4½	6	8¼	6	6	5	6½
Thickness of coal sampled	6	9	6	2	6	2	6	7½	6	4	5	5¾

[a] Not included in sample.

Sample 9302 was taken in last break-through on main entry 2, 6,000 feet from opening.

Sample 9303 was taken in pillar in room 5 on right entry 8, off main entry 1, 4,400 feet from opening.

Sample 9304 was taken in pillar in room 15, cross entry 3, off right entry 7, 4,000 feet from opening.

Sample 9305 was taken in room 10, cross entry 3, off entry 35, 6,000 feet from opening.

Sample 9306 was taken in room 10 on left cross entry 1, off entry 34, 4,500 feet from opening.

Sample 9307 was taken from pillar 12, off cross entry 3, off entry 6, 2,800 feet from opening.

A composite sample was made by mixing samples 9302, 9304, 9305, 9306, and 9307 for an ultimate analysis, the results of which are shown under laboratory No. 9469.

The bed was also measured and sampled at six points by J. J. Rutledge on March 10, 1910, as described below:

Sections of coal bed in Pulaski No. 2 mine at Eckman.

Laboratory No.	10093		10094		10095		10096		10097		10098	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	5	0	5½	0	7	0	8	0	8¾	0	7
Bone [a]	0	2	..	..	..	..	0	¾	..	..	..	..
Sulphur [a]	..	..	0	1	0	1½	..	..	0	½	0	2
Coal	1	11½	1	8	2	½	1	11½	1	9¾	1	9½
Bone [a]	0	1½	0	2	0	5	0	½	0	¾	0	2
Coal	3	3	3	5	3	4½	0	6½	0	6	4	½
Mother coal	..	..	..	..	..	..	0	¼	0	¼	..	..
Coal	..	..	..	..	..	..	3	6	3	3	..	..
Thickness of bed	5	11	5	9½	6	6½	6	9½	6	5	6	9
Thickness of coal sampled	5	7½	5	6½	6	0	6	8¼	6	3¾	6	5

[a] Not included in sample.

Sample 10093 was taken from barrier pillar between cross entries 2 and 3, off entry 6.

Sample 10094 was taken on barrier pillar between cross entries 3 and 4, off entry 7.

Sample 10095 was taken on barrier pillar between cross entries 7 and 8, off old main entry.

Sample 10096 was taken in face of entry 34.

Sample 10097 was taken in face of entry 35, off main entry 2.

Sample 10098 was taken in last break-through between main entry 2 and air course.

The samples were dry when taken.

A composite sample was made by mixing the pillar samples 10093, 10094, and 10095 for an ultimate analysis, the results of which are shown under laboratory No. 10103.

A composite sample was also made by mixing the pillar samples 10096, 10097, and 10098 for an ultimate analysis, the results of which are shown under laboratory No. 10104.

Note.—The daily capacity of mine at time of sampling in 1909 was 1,500 tons. Output of mine should be considered in connection with that of the Pulaski No. 1 mine.

For chemical analysis of this coal see part I of this bulletin, p. 255.

ECKMAN. EUREKA MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8786, 8787, 8788, 8789, 8837 (p. 257).

Mine.—Eureka; Norfolk & Western district; a drift mine 1 mile southwest of Eckman, on the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness of coal as mined was 6½ to 7½ feet; roof, massive, strong, blue shale, about 3 feet in thickness, capped with sandstone; floor, hard, blue, shaly underclay with smooth surface.

The bed was measured and sampled at four points on August 10, 1909, by H. M. Wolflin, as described below:

Sections of coal bed in Eureka mine, 1 mile southwest of Eckman.

Section	A		B		C		D	
Laboratory No	8789		8788		8787		8786	
Roof, massive blue clay shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright hard coal	0	3	0	4¾	0	2½	0	3¾
Sulphurous bony coal[a]	0	2½	0	¾	0	2	0	2
Hard bright coal (dull streaks)	1	10½	1	9½	..	..	..	..
Bright coal (mother-coal streaks)	..	..	..	..	0	11	1	0
Hard gray coal	..	..	..	..	0	4	0	3
Bright coal (in places mother-coal streaks)	..	..	..	..	0	9	0	6¼
Bony coal[a]	0	5	0	3½	0	3½	0	4
Hard gray coal	0	4	0	5	0	4	0	5
Bright tough coal (in places mother-coal streaks)	1	5	1	11	1	4	1	3½
Hard gray coal	0	1¼	0	4	0	1½	1	2
Bright tough coal	0	6	..	..	0	5	..	..
Hard gray coal	0	5	..	..	0	3	..	..
Bright soft coal (mother-coal streaks)	2	¼	2	3½	2	0	1	8
Floor, hard, blue, shaly underclay.								
Thickness of bed	7	6½	7	6	7	1½	7	1½
Thickness of coal sampled	6	11	7	1¾	6	8	6	7½

[a] Not included in sample.

Section A (sample 8789) was cut from face of entry 26, off cross entry 6, off main entry.

Section B (sample 8788) was cut from face of entry 2, off right entry 26, off cross entry 6, off main entry.

Section C (sample 8787) was cut from face of entry 7, off main entry.

Section D (sample 8786) was cut from face of entry 39, off cross entry 6, off main entry.

A composite sample was made by mixing samples Nos. 8786, 8787, 8788, and 8789 for an ultimate analysis, the results of which are shown under laboratory number 8837.

Notes.—The coal was undercut entirely by hand in the bottom part of the bed, and was shot down with black blasting powder. The tipple was equipped with bar screens with ¼-inch and 3-inch openings and with revolving screens with ½-inch and 1¼-inch openings. The slack was coked in beehive ovens. About 80 per cent of the total output was shipped as run-of-mine coal. The coal was picked on the car. The estimated average daily output was 700 tons, and 1,500 tons was a maximum day's run. The haulway from the drift mouth was being double-tracked, and other preparations were being made to greatly increase the output. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal, see part I of this bulletin, p. 257.

ELKHORN. UPLAND MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8228, 8229, 8230, 8231, 8232, 8233, 8302 (p. 257).

Mine.—Upland; Norfolk & Western district; a drift mine ½ mile west of Elkhorn, on the Norfolk & Western Railway.

Coal bed.—Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, uniform, ranging as mined from 7 feet to 8 feet; roof, strong gray shale, capped with sandstone 3 to 8 feet above; floor, medium hard clay with smooth surface; cover, for the most part, 150 to 350 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay on July 14, 1909, as described below:

Sections of coal bed in Upland mine, ½ mile west of Elkhorn.

Section	A		B		C		D		E		F	
Laboratory No	8228		8229		8230		8231		8232		8233	
Roof, strong gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	9	0	10	0	8	0	10¼	0	8¼	0	10
Sulphur band [a]	0	⅛	0	1	0	1	0	¼	0	½	0	¾
Soft bright coal (mother-coal streaks)	1	½	1	1	1	0	1	10¼	1	11¼	1	8
Harder silvery bright coal	0	5	0	4½	0	3	..	..	..	..	..	..
Soft bright coal	0	3½	0	5	0	6	..	..	..	..	..	..
Bone [a]	0	3	0	4	0	2½	0	1½	0	1¾	0	4
Soft bright coal	1	2	0	4½	0	9	2	5	2	10½	2	5
Grayish coal (mother-coal streaks)	0	2	0	1	0	3½	..	..	..	..	..	..
Soft bright coal	0	1½	0	8	0	5	..	..	..	..	..	..
Grayish coal	0	1½	0	2	0	1	..	..	..	..	..	..
Soft bright coal	0	8½	1	0	0	7	..	..	..	..	..	..
Harder grayish coal	0	3	0	2	0	2	0	1½	0	1	0	2½
Soft bright coal	2	0	2	1½	1	9	2	0	1	6	1	9¼
Floor, hard clay.												
Thickness of bed	7	3⅝	7	8½	6	9	7	4¾	7	3¼	7	3½
Thickness of coal sampled	7	½	7	3½	6	5½	7	3	7	1	6	10¾

[a] Not included in sample.

Section A (sample 8228) was cut from a pillar in room 15 on cross entry 6, 2,000 feet from drift mouth.

Section B (sample 8229) was cut from a pillar in room 44 on cross entry 7, 5,500 feet from drift mouth.

Section C (sample 8230) was cut from a pillar in room 41 on cross entry 10, 6,200 feet from drift mouth.

Section D (sample 8231) was cut from the face of room 40 on cross entry 13, 7,900 feet from drift mouth.

Section E (sample 8232) was cut from the face of the mill branch entry near break-through 4, inside cross entry 13, 6,500 feet from drift mouth.

Section F (sample 8233) was cut from the face of room 51 on cross entry 11, 7,660 feet from drift mouth.

A composite sample was made by mixing both face and pillar samples 8228, 8229, 8230, 8231, 8232, 8233 for an ultimate analysis, the results of which are shown under laboratory No. 8302.

Notes.—The coal from this mine, like that from many others in this field, is soft and friable, and in the ordinary mining operations about 40 per cent of the total coal is reported as slack. This slack was coked in beehive ovens. The coal was undercut, in bottom part of bed, by hand in the rooms and with chain machines in the entries, and it was shot down with black powder. The tipple was equipped with bar and shaking screens. The coal was picked on the car. The daily output at time of sampling in 1909 was 1,600 tons, and 1,800 tons was a maximum day's run. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal see part I of this bulletin, p. 257.

ELKHORN. CROZER MINES NOS. 1 AND 2.

Sample.—Bituminous coal; Pocahontas field; analyses Nos. 8222, 8223, 8224, 8225, 8226, 8227, 8297, 8429, 8430, 8451, 8452, 8453, 8470, 8471 (pp. 257, 258).

Mines.—Crozer Nos. 1 and 2; Norfolk & Western district; drift mines operating in the same bed and using same tipple, 1 mile east of Elkhorn on the Norfolk & Western Railway.

Coal bed.—Known as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, nearly uniform, ranging as mined from 7 feet 6 inches to 8 feet 4 inches; roof, strong gray shale, 3 to 8 feet thick, and capped with sandstone; floor, soft clay with smooth surface, which in places mixed with the coal in loading; cover, for the most part, 175 to 480 feet thick.

The bed was measured and sampled at six points in Crozer No. 1 mine by R. Y. Williams and A. C. Ramsay on July 15, 1909, and at five points in Crozer No. 2 mine by A. C. Ramsay on July 17 and 19, 1909, as described below:

Sections of coal bed in Crozer No. 1 mine, 1 mile east of Elkhorn.

Section	A		B		C		D		E		F	
Laboratory No	8222		8223		8224		8225		8226		8227	
Roof, gray shale capped with sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	9	0	10½	0	8	0	8½	0	8¼	0	9
Sulphur band	[a] 0	1	[a] 0	1¼	[a] 0	2	0	2	[a] 0	¾	[a] 0	¾
Soft bright coal, with mother-coal streaks	1	10	1	10	1	11	1	8½	1	9	1	10
Bony coal	[a] 0	4	[a] 0	3	[a] 0	4	[a] 0	4¾	[a] 0	4½	[a] 0	3
Soft bright coal, with mother-coal streaks	1	5	1	4	1	4	1	2½	2	0	1	4
Dull hard gray coal	0	1½	0	3	0	2	0	2¼	0	1	0	½
Soft bright coal, with mother-coal streaks	0	11	1	11	1	1	3	2¼	2	5¾	1	2
Hard gray coal	0	1½	0	2	0	2	..	..	..	..	0	2
Soft bright coal, with mother-coal streaks	2	2	2	2	2	2	..	..	..	..	1	11¼
Floor, soft underclay.												
Thickness of bed	7	9	8	10¾	8	0	7	6¾	7	5¼	7	6½
Thickness of coal sampled	7	4	8	6½	7	6	7	2	7	0	7	2¾

[a] Not included in sample.

Section A (sample 8222) was cut from a pillar near the head of room 33 on cross entry 12, 7,500 feet from drift mouth.

Section B (sample 8223) was cut from a pillar near the head of room 19 on cross entry 11, 6,800 feet from drift mouth.

Section C (sample 8224) was cut from a pillar near the head of room 4 on cross entry 9, 4,500 feet from drift mouth.

Section D (sample 8225) was cut from the face of room 13 on cross entry 13, 7,200 feet from drift mouth.

Section E (sample 8226) was cut from the face of room 10 on cross entry 16, 8,100 feet from drift mouth.

Section F (sample 8227) was cut from the face of cross entry 20, 9,600 feet from drift mouth.

A composite sample was made by mixing both face and pillar samples 8222, 8223, 8224, 8225, 8226, and 8227 for an ultimate analysis, the results of which are shown under laboratory No. 8297.

Section of coal bed in Crozer No. 2 mine, 1 mile east of Elkhorn.

Section	A		B		C		D		E	
Laboratory No	8429		8430		8451		8452		8453	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	9½	0	7	0	10½	0	10¾	0	9¾
Sulphur [a]	0	1	0	1	0	½	0	¾	0	1¼
Soft bright coal, with mother-coal streaks	1	4	1	8½	1	3½	1	4	1	4½
Hard gray coal	0	2½	..	..	0	1½	0	1	0	2¼
Soft bright coal, with mother-coal streaks	0	4½	..	..	0	4½	0	5½	0	4¾
Bony coal [a]	0	3¼	0	4½	0	4¾	0	2½	0	4½
Soft bright coal, with mother-coal streaks	2	½	1	7¼	2	4	1	8	1	3½
Hard gray coal	..	..	0	2	..	..	0	1¾	0	2
Soft bright coal, with mother-coal streaks	..	..	0	2½	..	..	1	½	0	7
Hard gray coal	..	..	0	½	..	..	..	..	0	¾
Soft bright coal	..	..	0	1¾	..	..	..	..	0	4¾
Hard gray coal	0	1	0	½	0	2	0	1	0	3
Soft bright coal, with mother-coal streaks	2	7½	2	7	2	3½	2	½	2	4
Floor, soft underclay.										
Thickness of bed	7	9¾	7	6½	7	10¾	8	¼	8	4
Thickness of coal sampled	7	5½	7	1	7	5½	7	9	7	10¼

[a] Not included in sample.

Section A (sample 8429) was cut from the pillar of room 17 on cross entry 12, 6,400 feet from drift mouth.

Section B (sample 8430) was cut from the chain pillar between cross entries 11 and 12, 6,000 feet from drift mouth.

Section C (sample 8451) was cut from the face of room 22 on cross entry 15, 7,300 feet from drift mouth.

Section D (sample 8452) was cut from the face of room 13 on entry 3, 8,200 feet from drift mouth.

Section E (sample 8453) was cut from the face of room 62 on the main entry, 10,500 feet from drift mouth.

A composite sample was made by mixing the pillar samples 8429 and 8430 for an ultimate analysis, the results of which are shown under laboratory No. 8470.

A composite sample was also made by mixing the face samples 8451, 8452, and 8453 for an ultimate analysis, the results of which are shown under laboratory No. 8471.

Notes.—The coal from these mines, like that from many others in this field, is soft and friable, and in the ordinary mining operations about 40 per cent of the total coal was reported as slack. This slack was coked in beehive ovens. The coal was undercut in bottom part of bed, by hand in the rooms, and by chain machines in the entries; it was shot down with black powder. The tipple was equipped with bar and cylindrical screens. The coal was picked on the car. The daily output averaged 1,600 tons, and 1,800 tons was the maximum day's run. Plans were being completed to increase the daily output to 2,000 tons. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal see part I of this bulletin, pp. 257, 258.

ELK RIDGE. ELK RIDGE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8319, 8320, 8384, 8385, 8386, 8463, 10035 (pp. 258, 259).

Mine.—Elk Ridge; Norfolk & Western district; a drift mine at Elk Ridge on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 6 to 8 feet; roof, gray shale (in places rather treacherous) from 4 to 20 feet in thickness, capped with sandstone; floor, hard, gray, shaly underclay with smooth surface.

The bed was measured and sampled at five points by J. J. Rutledge and H. M. Wolflin on July 19, 1909, as described below:

Sections of coal bed in Elk Ridge mine at Elk Ridge.

Section	A		B		C		D		E	
Laboratory No	8319		8320		8384		8385		8386	
Roof, gray clay shale.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	F.	in.
Coal	0	8	0	9¾	0	9	0	7½	0	10
Sulphurous bone [a]	0	¾	0	⅝	0	1	0	1½	0	2
Coal (sometimes streaks of hard mother coal)	1	7	1	5¾	1	8	1	6½	1	7
Bone [a]	0	3½	0	4	0	2¼	0	3½	0	3
Coal	1	2¼	1	2½	4	¼	4	¼	3	9
Hard gray coal	1	4	0	11	..	..	..	..	..	..
Soft coal (mother-coal streaks)	1	5½	1	10⅜	..	..	..	..	..	..
Floor, hard, gray, shaly underclay.										
Thickness of bed	6	7	6	8	6	8½	6	7¼	6	7
Thickness of coal sampled	6	2¾	6	3⅜	6	5¼	6	2¼	6	2

[a] Not included in sample.

Section A (sample 8319) was cut from pillar 38, off haulway 10, off "old" drift.

Section B (sample 8320) was cut from room 4, off entry 1.

Section C (sample 8384) was cut from entry 4 between rooms 3 and 4 (pillar workings).

Section D (sample 8385) was cut from face of entry 6½.

Section E (sample 8386) was cut from entry 8, between rooms 21 and 22.

A composite sample was made by mixing both face and pillar samples 8319, 8320, 8384, 8385, and 8386 for an ultimate analysis, the results of which are shown under laboratory No. 8463.

The bed was also measured and sampled at one point by J. J. Rutledge on January 20, 1910, as shown below:

Section of coal bed in Elk Ridge mine at Elk Ridge.

Laboratory No	10035	
	Ft.	*in.*
Coal	2	8
Bone [a]	0	2½
Coal	4	1
Thickness of bed	6	11½
Thickness of coal sampled	6	9

[a] Not included in sample.

The sample was taken in room 46, off entry 6, "new-drift" side. It was dry when taken.

Notes.—The coal at this mine was undercut entirely by hand, in bottom part of bed, and shot down with black powder. The tipple was equipped with bar screens with ¼, ¾, and 1¼ inch openings, the screenings were coked in beehive ovens. There were at the plant 200 ovens, 94 of which were "fired" in July, 1909. Of the entire output of the mine about two-thirds was shipped as run-of-mine coal. The coal was picked on the car by five trimmers. The daily output averaged about 870 tons, and 1,500 tons was a maximum day's run. It was planned to increase the tonnage. Most of the output was to be derived from pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 258, 259.

ENNIS. TURKEY GAP MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 5789 and 5790 (Jamestown No. 13); analyses Nos. 8052, 8053, 8054, 8055, 8056, 8057, 8116 (p. 259).

Mine.—Turkey Gap; Norfolk & Western district; a drift mine, three-fourths mile west of Ennis, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 6 feet 5 inches to 8 feet; roof, strong, gray shale with a cap rock 15 feet above; the roof rarely fell with the coal; floor, hard gray clay with smooth surface; cover, for the most part, 150 to 400 feet thick.

The bed was measured and sampled at six points by J. J. Rutledge on June 29, 1909, as described below:

Sections of coal bed in Turkey Gap mine, three-fourths mile west of Ennis.

Section	A		B		C		D		E		F	
Laboratory No	8052		8053		8054		8055		8056		8057	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11	..	9	1	4	1	3	1	8½	0	5½
Sulphur	[a] 0	1½	[a] 0	2	..	..	..	..	..	..	[a] 0	1½
Coal	1	6½	2	0	..	..	..	..	..	..	1	10
Bony coal	[a] 0	3	[a] 0	6	..	4	[a] 0	2	[a] 0	3½	[a] 0	4¼
Coal	5	1	4	5	1	6	1	9	4	5½	3	1½
Bony coal	..	..	..	..	[a] 0	3	0	3	..	..	..	..
Coal	..	..	..	..	2	5	2	5	..	..	..	..
Mother coal	..	..	..	..	..	..	..	..	..	..	0	1
Coal	..	..	..	..	..	..	..	..	..	..	1	3½
Floor, hard gray clay.												
Thickness of bed	7	11	7	10	5	10	5	10	6	5½	7	3¼
Thickness of coal sampled	7	6½	7	2	5	7	5	8	6	2	7	9½

[a] Not included in sample.

Section A (sample 8052) was cut from room 53, off entry 12, 3,500 feet northeast of the drift mouth.

Section B (sample 8053) was cut from room 43, off entry 14, 3,100 feet northeast of the drift mouth.

Section C (sample 8054) was cut from room 6, off entry 19, 6,300 feet east of the drift mouth.

Section D (sample 8055) was cut from room 1, off entry 18, 5,200 feet east of the drift mouth.

Section E (sample 8056) was cut from room 49, off entry 16, 5,400 feet east of the drift mouth.

Section F (sample 8057) was cut from room 49, off entry 10, 3,000 feet northeast of the drift mouth.

A composite sample was made by mixing the face samples 8052, 8053, 8054, 8055, 8056, and 8057 for an ultimate analysis, the results of which are shown under laboratory No. 8116.

The bed was also measured and sampled at two points in the mine by K. M. Way, on November 7, 1907, as shown below:

Sections of coal bed in Turkey Gap mine at Ennis.

Section	A		B	
Laboratory No	5789		5790	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	11½	0	2½
Sulphur band [a]	0	2¾	..	..
Mother coal	..	..	0	¼
Coal	0	10½	1	3½
Mother coal	0	⅛	..	..
Bony coal [a]	..	..	0	4
Coal	0	2½	1	8
Mother coal	0	¼	..	..
Bony coal [a]	..	..	0	3
Coal	0	8¼	1	2¾
Bony coal [a]	0	3¾	..	..
Mother coal	..	..	0	¼
Coal	1	11	1	5
Bony coal [a]	0	2	..	..
Coal	1	3¼	..	..
Mother coal	0	½	..	..
Coal	1	4	..	..
Floor, shale.				
Thickness of bed	8	⅜	6	5¼
Thickness of coal sampled	7	3⅞	5	10¼

[a] Not included in sample.

Section A (sample 5789) was measured in room 57, off cross entry 14, 8,000 feet northeast of the drift mouth.

Section B (sample 5790) was measured in room 46, off cross entry 16, 8,100 feet northeast of the drift mouth.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens, with ½-inch to 1½-inch spaces, making screenings equal to 25 per cent of the output; this screened coal was coked in beehive ovens, of which there were 249. The coal was picked on the car by four trimmers. The daily output, in 1909, at time of sampling, averaged 1,200 tons, and 1,800 tons was a maximum day's run. The future output was to be derived from pillars.

For results of briquetting tests of this coal, see Bureau of Mines Bull. 34, p. 15.

For chemical analyses of this coal see part I of this bulletin, p. 259; also U. S. Geol. Survey Bull. 362, p. 21.

GILLIAM. GILLIAM MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8366, 8367, 8368, 8369, 8370, 8462 (p. 260).

Mine.—Gilliam; Norfolk & Western district; a drift mine at Gilliam on the Northfork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 5 to 6 feet; roof, strong dark shale, underlain with 3 inches of draw slate; it was reported that a 16-inch bed of coal lies 15 feet above this bed; floor, hard shale with smooth surface.

The bed was measured and sampled at five points by J. J. Rutledge, on July 20, 1909, as described below:

Sections of coal bed in Gilliam mine at Gilliam.

Section	A		B		C		D		E	
Laboratory No	8366		8367		8368		8369		8370	
Roof, strong dark shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	4½	1	3¼	1	4½	1	6
Bony, sulphur band	[a]0	2	[a]0	4	[a]0	3	[a]0	2	[a]0	3
Coal	1	5¾	0	9	1	4	2	2½	0	4½
Gray coal to hard shale	[a]0	3½	0	2	0	1½	..	..	[a]0	1
Coal	0	11½	0	3	..	..	..	..	..	..
Gray coal to sulphur band	[a]0	½	0	4	..	..	0	1	..	..
Coal	2	8¾	2	2	2	2	1	5	3	6
Floor, hard shale.										
Thickness of bed	6	8	5	4½	5	1¾	5	3	5	8½
Thickness of coal sampled	6	2	5	½	4	10¾	5	1	5	4½

[a] Not included in sample.

Section A (sample 8366) was cut from the face of cross entry 2, off the main heading.

Section B (sample 8367) was cut from a chain pillar on air course 41.

Section C (sample 8368) was cut from a pillar on diagonal haulway 1, off the main entry.

Section D (sample 8369) was cut from the face of room 34 on entry 10, off diagonal entry 1.

Section E (sample 8370) was cut from the face of room 9 on entry 4, off diagonal entry 1.

A composite sample was made by mixing both face and pillar samples 8366, 8367, 8368, 8369, and 8370 for an ultimate analysis, the results of which are shown under laboratory No. 8462.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with ½, ¾, and 1½ inch spaces. The screenings were coked in beehive ovens. The coal was picked on car by five trimmers. The daily output averaged 800 tons, and 1,200 tons was the maximum day's run. The future output was to be derived largely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 260.

HUGER. NORTH SIDE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8730, 8731, 8735, 8740, 8844 (pp. 260, 261).

Mine.—North Side; Norfolk & Western district; a shaft mine, at Huger, 2 miles above Welch, on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 4. Carboniferous age, Clark formation. The coal varies in thickness from 4 to 5½ feet; it has a hard sandstone roof about 60 feet thick, and a hard underclay floor with a smooth surface. There is one band of shale and two bands of bony coal in the bed, which are taken out of the coal and gobbed in the mining. Neither the floor nor the roof got mixed with the coal. The bed lies at a depth of 180 feet below the surface.

The bed was measured and sampled at four points on August 7 and 9, 1909, by J. W. Groves, as described below:

Sections of coal bed in North Side mine at Huger.

Section	A		B		C		D	
Laboratory No.	8735		8730		8731		8740	
Roof, hard sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	..	..	[a] 0	3	..	..	..	..
Rash (coal and shale, thin layers)	[a] 0	7	..	..	..	..	..	..
Coal	..	..	..	..	[a] 0	3	0	2½
Shale	[a] 0	1	[a] 0	1	[a] 0	2	[a] 0	1¼
Coal	1	8½	1	5½	1	6½	1	5½
Bony coal	[a] 0	1¼	[a] 0	1½	[a] 0	2½	[a] 0	2
Coal	1	4½	1	4	1	4	1	4½
Bony coal	[a] 0	3	[a] 0	2	[a] 0	1½	..	..
Bony coal and shale	..	..	..	..	..	..	[a] 0	2½
Coal	1	0	1	0	1	1½	1	3
Floor, hard underclay.								
Thickness of bed	5	1¼	4	5	4	9	4	9¼
Thickness of coal sampled	4	1	3	9½	4	0	4	3½

[a] Not included in sample.

Section A (sample 8735) was cut from the face of left entry 1.

Section B (sample 8730) was cut from the face of left entry 2.

Section C (sample 8731) was cut from the face of left entry 3.

Section D (sample 8740) was cut from the face of main entry.

A composite sample was made by mixing face samples 8730, 8731, 8735, and 8740 for an ultimate analysis, the results of which are shown under laboratory No. 8844.

Notes.—The coal was undercut with electric machines, both chain and puncher machines being used, and was shot down with a permissible explosive. The coal was picked on a picking table and on the cars. At the time of sampling and inspection, in August, 1909, three trimmers were on the picking table and one on the car. The mine had no screens at that time, but these were to be installed later. The capacity of the mine was 400 tons daily, the average output being 250 tons. The mine was new, and its capacity was to be largely increased. The output for some time was to be entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, pp. 260, 261.

HUGER. SOUTH SIDE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8728, 8729, 8739, 8846 (p. 261).

Mine.—South Side; Norfolk & Western district; a shaft mine at Huger, 2 miles above Welch, on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 4. Carboniferous age, Pottsville formation. The coal varies in thickness from 4 to 5½ feet; has a hard sandstone roof about 60 feet thick, and a hard underclay floor with a smooth surface. There is one band of shale and two bands of bony coal in the bed, which are taken out of the coal and gobbed in the mining. Neither the floor nor the roof got mixed with the coal. The bed lies at a depth of 180 feet below the surface.

The bed was measured and sampled at three points by J. W. Groves on August 9, 1909, as described on the following page.

Sections of coal bed in South Side mine at Huger.

Section	A		B		C	
Laboratory No.	8739		8729		8728	
Roof, hard sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a] 0	2	1	9	1	6
Shale	[a] 0	1¼	..	..	..	..
Gray band	..	..	[a] 0	3	..	..
Coal	1	10	1	3½	..	..
Bony coal	..	..	[a] 0	2½	[a] 0	1
Pyrites	..	..	..	..	[a] 0	1
Bony coal	..	..	..	..	[a] 0	1½
Shale	[a] 0	1½	..	..	..	..
Coal	1	9	1	1	1	2½
Bony coal	[a] 0	2	..	..	[a] 0	2½
Coal	1	1	..	..	1	2½
Floor, hard underclay (smooth surface).						
Thickness of bed	5	2¾	4	7	4	5
Thickness of coal sampled	4	8	4	1½	3	11

[a] Not included in sample.

Section A (sample 8739) was cut from the face of right entry 1.

Section B (sample 8729) was cut from the face of cross entry 2.

Section C (sample 8728) was cut from the face of main south entry.

A composite sample was made by mixing samples 8728, 8729, and 8739 for an ultimate analysis, the results of which are shown under laboratory No. 8846.

Notes.—The coal was undercut with electric chain machines and with air puncher machines, and was shot down with a permissible explosive. The coal tipple was a temporary one, which loaded all coal in run-of-mine form. Two trimmers cleaned the coal as it was loaded in the cars. A new tipple, it was stated at time of sampling in 1909, was soon to be erected, having self-dumping cages and three loading tracks; screens and a picking table were also to be installed at this tipple. The capacity of the mine at that time was 150 tons, and the actual output 100 tons daily, loaded as run-of-mine coal. The output was to be greatly increased.

For chemical analyses of this coal see part I of this bulletin, p. 261.

JED. JED MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8444, 8445, 8446, 8447, 8469, 10034 (p. 261).

Mine.—Jed; Norfolk & Western district; a shaft mine, 285 feet in depth, at Jed, on the Tug Fork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas series. Thickness, uniform, ranging as mined from 4 feet 8 inches to 5 feet 4 inches; dip, 1½° N. 45° W.; roof, strong bedded sandstone, underlain with 12 to 15 inches of treacherous shale which did not regularly fall with the coal but was brushed in the entries; floor, 12 to 18 inches of hard clay with smooth surface; cover, for the most part, 300 to 600 feet thick.

The bed was measured and sampled at four points by R. Y. Williams on July 27, 1909, as described below:

Sections of coal bed in Jed mine at Jed.

Section	A		B		C		D	
Laboratory No.	8444		8445		8446		8447	
Roof, sandstone and shale (tender).	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard bright coal	0	5½	..	..	..	..	..	..
Soft bright coal (mother-coal streaks)	0	4	..	..	..	..	1	0
Hard grayish coal	0	2	..	..	..	..	0	1
Soft bright coal (mother-coal streaks)	0	10½	1	10½	1	11	1	0
Gray and bony coal[a]	0	2½	0	3¼	0	3	0	4
Soft bright coal (mother-coal streaks)	0	4½	0	5	0	4	0	5¾
Dull gray coal	0	2	0	1½	0	1½	0	1
Soft bright coal (mother-coal streaks)	2	3	2	4½	2	6¼	2	5
Floor, hard clay.								
Thickness of bed	4	10	5	¾	5	1¾	5	4¾
Thickness of coal sampled	4	7½	4	9½	4	10¾	5	¾

[a] Not included in sample.

Section A (sample 8444) was cut from the face of east entry 2, 1,000 feet from the shaft.

Section B (sample 8445) was cut from the face of the main entry, 2,200 feet from the shaft.

Section C (sample 8446) was cut from the face of east entry 3, 1,800 feet from the shaft.

Section D (sample 8447) was cut from the face of the main south entry, 700 feet from shaft.

A composite sample was made by mixing samples 8444, 8445, 8446, and 8447 for an ultimate analysis, the results of which are shown under laboratory No. 8469.

The bed was also measured and sampled at one point on January 19, 1910, by J. J. Rutledge, as described below:

Section of coal bed in Jed mine at Jed.

Laboratory No.	10034	
	Ft.	*in.*
Coal	1	11
Bone[a]	0	2
Coal	2	11
Thickness of bed	5	0
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken in the face of main entry 1 and was dry when taken.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed and was shot down with a short-flame explosive. The tipple had bar screens with ½-inch, 1¼-inch, and 3½-inch openings; in July, 1909, however, the entire output was shipped as run-of-mine coal. The coal was picked on car by three trimmers. This is a coking coal, but there were no ovens at the plant. The daily output averaged 400 tons, and 600 tons was a maximum day's run. It was planned to increase the production to 1,000 tons per day. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal see part I of this bulletin, p. 261.

KEYSTONE. KEYSTONE MINES NOS. 1 AND 2.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8709, 8710, 8711, 8795, 8706, 8708, 8707, 8794 (pp. 261, 262).

Mines.—Keystone Nos. 1 and 2; Norfolk & Western district; drift mines, ½ mile southeast of Keystone, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness ranges from 5½ to 6¾ feet. The roof is a hard gray shale with a good surface.

The bed was measured and sampled at six points by A. C. Ramsay on August 6, 1909, as described below:

Sections of coal bed in Keystone No. 1 mine, ½ mile southeast of Keystone.

Section	A		B		C	
Laboratory No.	8709		8710		8711	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal (mother-coal streaks)	0	10	0	9½	0	9
Sulphur[a]	0	1¾	0	2½	0	1¼
Soft bright coal (mother-coal streaks)	0	7	0	9½	0	9
Hard bright coal	0	9	0	1½	0	1½
Soft bright coal	..	..	0	7	..	..
Soft bright coal (mother-coal streaks)	..	..	..	..	0	9
Bony coal[a]	0	2½	0	2	0	1¾
Hard bright coal	0	4	0	3¾	0	4
Soft bright coal (mother-coal streaks)	0	8	0	10	0	9½
Hard gray coal	0	3	0	3	0	3
Soft bright coal (mother-coal streaks)	2	2½	2	3¼	2	5½
Floor, hard shale (smooth surface).						
Thickness of bed	5	11¾	6	4	6	5½
Thickness of coal sampled	5	7½	5	11½	6	2½

[a] Not included in sample.

Section A (sample 8709) was cut from face of entry 8, 11,000 feet from drift mouth.

Section B (sample 8710) was cut from face of entry 5, 10,000 feet from drift mouth.

Section C (sample 8711) was cut from pillar of room 6, off entry 2, 9,000 feet from drift mouth.

A composite sample was made by mixing samples 8709 and 8710 for an ultimate analysis, the results of which are shown under laboratory No. 8795.

Sections of coal bed in Keystone No. 2 mine, ½ mile southeast of Keystone.

Section	A		B		C	
Laboratory No	8706		8708		8707	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	9	..	..	0	7¾
Soft bright coal (mother-coal streaks)	..	..	0	8½	..	..
Sulphur [a]	0	2	0	3	0	1½
Soft bright coal (mother-coal streaks)	0	9	1	9	1	8¼
Hard bright coal	0	2	..	..	..	..
Soft bright coal (mother-coal streaks)	0	11¼	..	..	..	..
Bony coal [a]	0	3½	0	3¾	0	2¾
Soft bright coal (mother-coal streaks)	0	6½	..	..	0	7¼
Soft bright coal	..	..	0	8½	..	..
Hard gray coal	0	3	0	2	0	3¾
Soft bright coal	..	..	..	..	2	4¼
Soft bright coal (mother-coal streaks)	2	4	2	7	..	..
Floor, hard shale (smooth surface).						
Thickness of bed	6	2¼	6	5¾	5	11½
Thickness of coal sampled	5	8¾	5	11	5	7¼

[a] Not included in sample.

Section A (sample 8706) was cut from face of room 10, 5,000 feet from drift mouth.

Section B (sample 8708) was cut from pillar of entry 4, 3,000 feet from drift mouth.

Section C (sample 8707) was cut from pillar of room 10 on entry 1, 1,500 feet from drift mouth.

A composite sample was made by mixing samples 8707 and 8708 for an ultimate analysis, the results of which are shown under laboratory No. 8794.

Notes.—The coal at this mine was undercut by hand at bottom of bed and was shot down with black blasting powder. The tipple, which was used by mines Nos. 1 and 2, was equipped with bar screens with ¾-inch openings. Sixty per cent of the coal was shipped in run-of-mine form, the remainder being screened. This is a coking coal; 290 tons of the screenings was coked at the mine daily. The coal was picked on the car by three trimmers. The daily output averaged about 375 tons at No. 1 mine and 350 tons at No. 2 mine, and the maximum day's run was 500 and 495 tons, respectively. The output was to be increased and derived in equal amounts from advance workings and pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 261, 262.

KYLE. LYNCHBURG MINE.

Sample.—Bituminous coal; Pocahontas field; analyses Nos. 8666, 8667, 8668, 8669, 8670, 8671, 8725 (p. 262).

Mine.—Lynchburg; Norfolk & Western district; a drift mine, at Kyle.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness of the bed is fairly uniform, averaging 7 feet, but ranging from 5 to 9 feet. The main roof is dark-gray clay, between which and the coal is a layer of "draw slate" 2 to 4 inches thick. The floor is a hard dark-colored clay with a smooth surface.

The bed was measured and sampled by C. A. Fisher on August 3, 1909, at six points, as described below:

Sections of coal bed in Lynchburg mine at Kyle.

Section	A		B		C		D		E		F	
Laboratory No	8666		8667		8671		8668		8670		8669	
Roof, dark-gray clay and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	..	..	..	..	0	1½	..	..	..	..	..	..
Bright coal (mother-coal streaks)	0	7	0	8	0	8	0	8	0	10	0	10
Bony coal (dark-colored "sulphur") [a]	0	1	0	1½	0	1¼	0	2	0	½	0	½
Bright loose coal (mother-coal streak)	2	0	2	1	2	0	2	0	2	0	2	0
Bony coal (dark brown or gray) [a]	0	2	0	½	0	½	0	1½	0	1	0	1
Bright firm coal (mother-coal streak)	4	7	4	9	4	5	4	4	4	0	4	2
Floor, hard, dark-gray clay.												
Thickness of bed	7	5	7	8	7	4¼	7	3½	6	11½	7	1½
Thickness of coal sampled	7	2	7	6	7	1	7	0	6	10	7	0

[a] Not included in sample.

Section A (sample 8666) was cut from face of main entry.

Section B (sample 8667) was cut from face of cross entry 11, off main entry.

Section C (sample 8671) was cut from room 20, off entry 9½, off main entry.

Section D (sample 8668) was cut from left upland entry.

Section E (sample 8670) was cut from North Carolina entry, pillar 17.

Section F (sample 8669) was cut from pillar 34, entry 6, off main entry.

A composite sample was made by mixing samples 8666, 8667, 8668, and 8671 for an ultimate analysis, the results of which are shown under laboratory No. 8725.

Notes.—The coal at this mine was undercut by hand at bottom of bed, and was shot down with black powder. In August, 1909, the tipple was being equipped with screens, both bar and revolving, the former with 3-inch spaces and the latter with ⅜-inch, ¾-inch, and 1¼-inch spaces. At that time 60 per cent of the coal was shipped in run-of-mine form, the screening from the remaining 40 per cent being coked. A total tonnage of 150 tons was coked daily. The coal was picked on the car by four trimmers. The estimated daily output was about 1,300 tons, and 1,500 tons was a maximum day's run. The future output was to be derived from both advance work and pillars, and the tonnage was to be increased.

For chemical analyses of this coal see part I of this bulletin, p. 262.

LANDGRAFF. EMPIRE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8658, 8659, 8660, 8661, 8662, 8699 (pp. 262, 263).

Mine.—Empire; Norfolk & Western district; a drift mine at Landgraff, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 5 to 7 feet; dip, slight to the northwest; roof, strong-bedded sandstone, underlain with 2 to 3 feet of dark gray shale which tends to fall with the coal; floor, hard clay with smooth surface.

The bed was measured and sampled at five points by C. A. Fisher on August 2, 1909, as described below:

Sections of coal bed in Empire mine at Landgraff.

Section	A		B		C		D		E	
Laboratory No	8662		8661		8660		8659		8658	
Roof, dark gray shale, 2 to 3 feet thick.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	2½	0	6	..	..	0	4½	0	2½
Hard, dark bone [a]	0	½	0	½	..	..	0	1	0	½
Bright coal (mother-coal streaks)	2	3½	1	11½	2	1	6	2	1	11½
Bone and gray coal [a]	0	1½	0	3	0	3½	..	..	0	4
Bright coal (mother-coal streaks)	3	5½	3	6	3	7	..	..	3	10½
Floor, hard clay.										
Thickness of bed	6	1½	6	3	5	11½	6	7½	6	5
Thickness of coal sampled	5	11½	5	11½	5	8	6	6½	6	½

[a] Not included in sample.

Section A (sample 8662) was cut from the face of the main entry.

Section B (sample 8661) was cut from the face of diagonal entry 9.

Section C (sample 8660) was cut from the face of diagonal entry 5.

Section D (sample 8659) was cut from a pillar between entries 18 and 20, off diagonal entry 1.

Section E (sample 8658) was cut from a pillar on entry 8, off diagonal entry 1.

A composite sample was made by mixing the face samples 8660, 8661, and 8662 for an ultimate analysis, the results of which are shown under laboratory No. 8699.

Notes.—The coal at this mine was undercut by hand in bottom part of bed and was shot down with black powder. The tipple was fully equipped with bar and shaking screens. The screenings were coked in beehive ovens. The coal was picked on car. The daily output averaged 1,200 tons, and 2,500 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 262, 263.

McDowell. McDowell Mine.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8499, 8500, 8501, 8502, 8533, 8686, 8687 (p. 263).

Mine.—McDowell; Norfolk & Western district; a drift mine at McDowell, on the Northfork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 5 feet 2 inches to 6 feet 2 inches; dip, 1½° NW.; roof, strong blue shale, underlain with 2 to 8 inches of draw shale, and with a cap rock 4 feet above; the draw shale tends to fall with the coal; floor, fairly hard clay shale with a smooth surface; cover, for the most part, 200 to 600 feet thick.

The bed was measured and sampled at five points by H. M. Wolflin on July 21, 23, and 24, 1909, and by J. J. Rutledge on July 24, 1909, as described below:

Sections of coal bed in McDowell mine at McDowell.

Section	A		B		C		D		E	
Laboratory No	8499		8500		8501		8502		8533	
Roof, strong blue shale and draw shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal with mother-coal streak	0	11½	0	11½	1	2	1	2	1	1½
Bone	[a]0	3	[a]0	3½	[a]0	2	[a]0	4¼	[a]0	4
Soft coal with mother-coal streak	4	¼	2	5½	2	8	2	1	1	7½
Gray bony coal	..	..	[a]0	1	0	2	0	2¼	0	3
Coal with mother-coal streaks	..	..	1	4	1	2½	1	6	2	0
Floor, hard clay shale.										
Thickness of bed	5	2¾	5	1½	5	4½	5	3½	5	4
Thickness of coal sampled	4	11¾	4	9	5	2½	4	11¼	5	0

[a] Not included in sample.

Section A (sample 8499) was cut from the face of the Scotland entry, 5,600 feet southeast of the drift mouth.

Section B (sample 8500) was cut from the face of the Ohio entry, 6,000 feet northeast of the drift mouth.

Section C (sample 8501) was cut from the face of the Pennsylvania entry, 5,400 feet southeast of the drift mouth.

Section D (sample 8502) was cut from a pillar of room 24 on the New York entry, 3,200 feet southeast of the drift mouth.

Section E (sample 8533) was cut from a pillar.

A composite sample was made by mixing the face samples 8499, 8500, and 8501 for an ultimate analysis, the results of which are shown under laboratory No. 8687.

A composite sample was also made by mixing the pillar samples 8533 and 8502 for an ultimate analysis, the results of which are shown under laboratory No. 8686.

Notes.—The coal at this mine was undercut with puncher machines, in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens, and the screenings were coked in beehive ovens. Of the entire output, 80 per cent was shipped in run-of-mine form. The coal was picked on car by eight trimmers. Daily output averaged 1,000 tons, 1,850 tons being a maximum day's run. Plans were being completed to build a new tipple and to increase the output, which was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 263.

McDowell. Greenbrier Mine.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8497, 8498, 8530, 8531, 8532, 8672 (p. 263).

Mine.—Greenbrier; Norfolk & Western district; a drift mine about 1¼ miles east of McDowell, on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 5 to 7 feet; roof, rather hard but brittle and treacherous blue shale from 1½ to 10 feet in thickness; between this and the coal there is about 5 inches of "muck" or "draw slate," which fell and tended to mix with the coal in mining; there is a cap rock of sandstone; floor, hard blue shaly underclay with smooth surface.

The bed was measured and sampled at five points on July 26, 1909, by J. J. Rutledge and H. M. Wolflin, as described below:

Sections of coal bed in Greenbrier mine, 1¼ miles east of McDowell.

Section	A		B		C		D		E	
Laboratory No	8497		8498		8530		8531		8532	
Roof, hard blue shale and muck or draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	0	1	0	1	2½	1	2	1	0
Bone [a]	0	4½	0	4	0	3	0	4	0	3
Coal	0	1½	2	6	0	4	0	2	0	4
Hard gray coal	0	2½	..	..	0	2	0	3½	0	3
Coal (in places mother-coal streaks)	2	3¼	..	..	2	4½	2	8	2	9½
Sulphurous bone [a]	0	¼	0	2¼	0	¼	0	½	0	¼
Soft coal (mother-coal streaks)	1	3¾	1	6¼	..	..	..	..	..	..
Coal	..	..	..	..	1	9½	1	1½	1	0
Floor, hard, blue shaly underclay.										
Thickness of bed	5	3¾	5	6½	6	1¾	5	9½	5	7¾
Thickness of coal sampled	4	11	5	¼	5	10½	5	5	5	4½

[a] Not included in sample.

Section A (sample 8497) was cut from pillar 4, off cross entry 4, off main entry 1.

Section B (sample 8498) was cut from pillar 3, off cross entry 6, off main entry 1.

Section C (sample 8530) was cut from room 1, off cross entry 9, off main entry.

Section D (sample 8531) was cut from face of cross entry 3.

Section E (sample 8532) was cut from face of cross entry 2, off entry 34.

A composite sample was made by mixing samples 8498, 8530, 8531, and 8532 for an ultimate analysis, the results of which are shown under laboratory No. 8672.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with black blasting powder. The tipple was equipped with bar screens with 3-inch and 1½-inch openings. The slack was coked in beehive ovens of which there were 200 at the plant, 80 being fired at time of sampling in July, 1909. The coal was picked by six trimmers. The daily output averaged about 800 tons, and 1,200 tons was a maximum day's run. It was planned to increase the capacity. The output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 263.

MARYTOWN. MARYTOWN MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8821, 8822, 8823, 8824, 8825, 8933 (p. 264).

Mine.—Marytown; Norfolk and Western district; a drift mine at Marytown on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. It varies in thickness from 3½ to 4 feet, and has no partings of inferior material. The roof has a smooth surface and is a hard gray shale, which did not fall with the coal. The floor is a hard underclay. The cover was 30 to 300 feet thick.

The bed was measured and sampled at five points by J. W. Groves on August 11, 1909, as described below:

Sections of coal bed in Marytown mine at Marytown.

Sections	A		B		C		D		E	
Laboratory No.	8821		8822		8823		8824		8825	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	10½	1	10	2	11	2	9	3	3
Mother coal	0	½	0	¼	0	½	0	¾	0	¼
Coal	1	½	0	4½	0	3	0	6¼	0	2¾
Mother coal	..	..	0	½	0	¾	..	..	..	..
Coal	..	..	0	3	0	3½	..	..	..	..
Mother coal	..	..	0	¾	0	¾	..	..	..	..
Coal	..	..	0	8½	0	2½	..	..	..	..
Floor, hard underclay.										
Thickness of bed	3	11½	3	3½	3	10	3	4	3	6
Thickness of coal sampled	3	11½	3	3½	3	10	3	4	3	6

Section A (sample 8821) was cut from face of last crosscut on main entry, 6,100 feet southeast of drift mouth.

Section B (sample 8822) was cut from the face of cross entry 3, off left entry 12, 5,000 feet southeast of drift mouth.

Section C (sample 8823) was cut from face of last crosscut on right entry 12, 4,600 feet southeast of drift mouth.

Section D (sample 8824) was cut from a pillar on cross entry 5, off left entry 10, 3,600 feet southeast of drift mouth.

Section E (sample 8825) was cut from the face of room 2, off cross entry 7, off right entry 11, 3,600 feet southeast of drift mouth.

A composite sample was made by mixing face samples 8821, 8822, 8823, and 8825 for an ultimate analysis, the results of which are shown under laboratory No. 8933.

Notes.—The coal at this mine was undercut with punching machines and hand picks and was shot down with black powder. The tipple was provided with shaker screens and two loading tracks. The coal was picked as it was loaded on the cars. The screenings, about 65 per cent of the output, went to by-product coke ovens. The remainder of the output was sold as lump, egg, and nut coal in proportions of 11, 14, and 10 per cent, respectively. The capacity of the mine was 1,025 tons daily; the estimated average output was about 700 tons daily. The output was to be largely from advance work, but eventually about in equal proportions from advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 264.

MAYBEURY. ELKHORN MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8506, 8507, 8508, 8509, 8510, 8588 (pp. 264, 265).

Mine.—Elkhorn; Norfolk and Western district; a drift mine near Maybeury on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 7 to 9 feet 6 inches; roof, clay shale of rather poor quality, in many places "top coal" was left as the immediate roof; floor, rather hard clay with smooth surface.

The bed was measured and sampled at five points by C. A. Fisher on July 24 and 26, 1909, as described below:

Sections of coal bed in Elkhorn mine at Maybeury.

Section	A		B		C		D		E	
Laboratory No	8506		8507		8508		8509		8510	
Roof, clay shale and draw slate.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
"Top coal"	[a] 1	3	[a] 1	6	1	4½	[a] 1	3	1	0
Sulphur band	[a] 0	½	[a] 0	½	[a] 0	½	[a] 0	½	[a] 0	½
Bright coal	2	0	2	2	2	2	2	9	2	5
Gray impure coal	[a] 0	3	[a] 0	2	[a] 0	3	[a] 0	2	[a] 0	2
Bright coal	3	0	2	8	3	1	0	11	2	9
Bony gray coal	[a] 0	2½	[a] 0	2	[a] 0	2	[a] 0	1	[a] 0	1
Bright coal	1	7	2	2	2	4	4	10	2	0
Floor, rather hard clay.										
Thickness of bed	8	4	8	10½	9	5	10	½	8	5½
Thickness of coal sampled	6	7	7	0	8	11½	8	6	8	2

[a] Not included in sample.

Section A (sample 8506) was cut from the face of room 11 on entry 4, off right entry 6.

Section B (sample 8507) was cut from a pillar on entry 14, between rooms 5 and 6.

Section C (sample 8508) was cut from a pillar on cross entry 16, between rooms 5 and 6.

Section D (sample 8509) was cut from a pillar at the head of entry 14.

Section D (sample 8510) was cut from a pillar in room 5 on entry 2 of section 95.

A composite sample was made by mixing the pillar samples 8507, 8508, 8509, and 8510 for an ultimate analysis, the results of which are shown under laboratory No. 8588.

An ultimate analysis was also made for the face sample 8506, the results of which are shown under the same laboratory No. 8506.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar and revolving screens, with ½-inch, ¾-inch, and 1¼-inch spaces. The screenings were coked in beehive ovens. The coal was picked on car. The daily output averaged 600 tons, and 1,700 tons was the maximum day's run. The future output was to be derived from both advance work and pillars, the larger portion (about 80 per cent) from the pillars.

For chemical analyses of this coal see part I of this bulletin, pp. 264, 265.

MAYBEURY. ANGLE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8454, 8455, 8456, 8401, 8402, 8403, 8472 (p. 265).

Mine.—Angle; Norfolk & Western district; a drift mine 2 miles northeast of Maybeury, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The acreage in this mine is separated into two divisions by what is locally known as the "Norfolk Split," which may be described as a thickening of the so-called "sulphur band" into a rock parting. The thickness of coal as mined ranges from 5 feet 8 inches under the above split to 8 feet 4 inches in the undisturbed portions; roof, strong blue shale underlain with 3 inches of "draw slate" that fell with the coal; floor, hard dark shale overlain with 1 inch of hard underclay with smooth surface; cover, for the most part, 500 to 800 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay on July 22, 1909, as described below:

Sections of coal bed in Angle mine, 2 miles northeast of Maybeury.

Section	A		B		C		D		E		F	
Laboratory No.	8454		8455		8456		8402		8403		8401	
Roof: strong blue shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	1	1¾	0	7	..	..	..	..	..	..	0	6½
Hard bright to gray coal	0	2¾	0	6	..	..	..	..	..	..	0	5½
Bone	[a] 0	4½	[a] 0	1½	..	..	..	..	..	..	[a] 0	3
Soft bright coal	0	5	0	4	0	11	0	10½	1	1	..	..
Bone to hard gray coal	0	3½	[a] 0	1	[a] 0	3½	[a] 0	3½	[a] 0	4	..	..
Soft bright coal	0	2	0	3½	0	7½	0	7½	..	..	0	7½
Bone to hard gray coal	0	2¼	0	1½	0	2½	0	1½	..	..	0	1½
Soft bright and mother coal	2	10	2	7	3	3	2	11	3	7½	2	9
Hard bright coal to sulphur band	0	3¾	[a] 0	1	..	..	[a] 0	1	[a] 0	1½	[a] 0	1½
Soft bright coal	0	2½	1	1½	..	..	0	9½	0	7	0	7½
Floor, hard underclay.												
Thickness of bed	6	2	5	10	5	3½	5	8½	5	9	5	6
Thickness of coal sampled	5	9½	5	6½	5	0	5	4	5	3½	5	1½

[a] Not included in sample.

Section A (sample 8454) was cut from face of the main air course, off entry A, 3,500 feet from drift mouth.

Section B (sample 8455) was cut from a pillar in room 6 on heading 8, 4,500 feet from drift mouth.

Section C (sample 8456) was cut from the face of room 35 on heading 2, 4,500 feet from drift mouth.

Section D (sample 8402) was cut from the face of entry 2, off Cherokee heading, 8,500 feet from drift mouth.

Section E (sample 8403) was cut from the face of entry 3, 8,000 feet from drift mouth.

Section F (sample 8401) was cut from the face of entry C, 8,000 feet from drift mouth.

A composite sample was made by mixing the face samples 8454, 8456, 8401, 8402, and 8403 for an ultimate analysis, the results of which are shown under laboratory No. 8472.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed, and was shot down with black powder. The coal was shipped in run-of-mine form, and was picked on cars by six trimmers. The estimated daily output was about 900 tons, and 1,300 tons was the maximum day's run. It was planned to increase the production 50 per cent. The output was to be derived chiefly from advance work. The output of mine should be considered in connection with that of the Norfolk mine.

For chemical analyses of this coal see part I of this bulletin, p. 265.

MAYBEURY. NORFOLK MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 7193, 7194, 8404, 8405, 8406, 8330, 8331, 8332, 8420 (p. 265).

Mine.—Norfolk; Norfolk & Western district; a drift mine 2 miles northeast of Maybeury on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 8 feet 6 inches to 9 feet 6 inches; roof, tender gray shale which frequently necessitated the leaving up of 12 inches of "top coal" for the immediate roof in advance work; the gray shale has a cap rock from 2 to 8 feet above; floor, hard slate with smooth surface; cover, for the most part, 300 to 600 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay on July 23, 1909, as described below:

Sections of coal bed in Norfolk mine, 2 miles northeast of Maybeury.

Section	A		B		C		D		E		F	
Laboratory No	8404		8405		8406		8332		8331		8330	
Roof, tender gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
"Top coal"	1	2¾	1	6	1	3	..	10	[a] 1	0	[a] 1	0
"Sulphur" band	[a] 0	1	[a] 0	2	[a] 0	2	[a] 0	3	[a] 0	2	[a] 0	2
Bright coal	0	1¼	0	4	..	..	..	..	..	..	0	9
Hard gray coal	0	1¾	..	..	0	3	..	..	..	..	..	..
Soft bright coal (mother-coal streaks)	1	11½	1	7	1	5½	2	0	2	3	1	2
Hard gray coal	..	..	0	6	0	6	..	..	..	..	0	4
Bone	[a] 0	5	[a] 0	3½	[a] 0	4	[a] 0	8	[a] 0	3	[a] 0	5
Soft bright coal (mother-coal streaks	0	8	0	10	0	3	2	4	0	7	0	10
Hard gray coal	[a] 0	1¾	0	3½	0	2¼	0	3	0	2	0	1½
Soft bright coal (mother-coal streaks)	2	8¾	3	5¼	3	3	1	10½	2	6	4	0
Hard, dense, dull gray coal	[a] 0	1	..	..	[a] 0	1¼	..	..	0	2½	..	..
Soft bright coal	1	3	..	..	0	11½	..	..	1	7½	..	..
Thickness of bed	8	9¾	8	11¼	8	8½	8	2½	8	9	8	9½
Thickness of coal sampled	8	1	8	5¾	8	1¼	7	3½	7	4	7	2½

[a] Not included in sample.

Section A (sample 8404) was cut from the face of cross right entry 2, 4,500 feet from drift mouth.

Section B (sample 8405) was cut from the face of room 7 on entry C–4, 4,000 feet from drift mouth.

Section C (sample 8406) was cut from a pillar of room 9 on entry B–1, 2,500 feet from drift mouth.

Section D (sample 8332) was cut from the old main chain pillar, 3,200 feet from drift mouth.

Section E (sample 8331) was cut from the face of cross right entry 1, 4,000 feet from drift mouth.

Section F (sample 8330) was cut from the face of heading 2, 4,500 feet from drift mouth.

A composite sample was made by mixing both face and pillar samples 8404, 8405, 8406, 8330, 8331, and 8332 for an ultimate analysis, results of which are shown under laboratory No. 8420 (p. 265).

The bed was also measured and sampled at two points by G. S. Pope on January 11, 1909, as described below:

Sections of coal bed in Norfolk mine, 2 miles northeast of Maybeury.

Laboratory No	7193		7194	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	¼	1	7¼
Gray coal	..	..	0	3¼
Bony coal	0	1	..	..
Coal	..	..	0	6
Gray coal	[a] 0	2½	..	..
Bright coal	0	10¼	1	1¾
Mother coal	0	⅜	0	½
Coal	0	7	0	2½
Gray coal	0	6	0	1¼
Bony coal	[a] 0	5	..	..
Coal	0	2	0	1¾
Bony coal	[a] 0	2½	[a] 0	4
Soft coal	0	2¼	0	4¾
Gray coal	..	..	0	1¼
Bony coal	[a] 0	2½	..	..
Soft coal	..	..	0	4¼
Bright coal	2	3	..	..
Gray coal	0	3	0	2¼
Bright coal	..	..	0	10¾
Coal	0	9	..	..
Mother coal	0	⅜	0	¼
Coal	0	11¾	0	10¼
Mother coal	..	..	0	¼
Coal	..	..	1	3½
Floor, gray shale.				
Thickness of bed.	8	8¾	8	5¾
Thickness of coal sampled	7	8¼	8	1¾

[a] Not includedi n sample.

Sample 7193 was taken 3,180 feet southwest of opening, 400 feet off left entry 1, in room 3, parallel to entry 13.

Sample 7194 was taken 1,100 feet south by 2,600 feet east of opening in air course C–3.

Notes.—Parting No. 3 is locally termed a "sulphur band" but it is really a soft bone. Directly opposite the side of aircourse near the point where section 7194 was taken was a sulphur band that does not show in sample taken. The coal at this mine was undercut with chain machines in bottom part of bed, and was shot down with black powder. The tipple was situated in a narrow valley and served for both the Norfolk and the Angle mines which are located in opposite hillsides. The tipple was well equipped with screens of both the revolving and the bar types, with ½-inch, ¾-inch, 1½-inch, 2-inch, 2¼-inch, 2½-inch, 3-inch, 4-inch, and 6-inch spaces. The coal from the Norfolk mine was all screened, and the screenings, which amounted to 25 per cent of the whole output, were coked in beehive ovens. The coal was picked on the car by three trimmers. The daily output of the mine at time of sampling averaged 1,600 tons, and 2,500 tons was a maximum day's run. It was planned to increase the production 50 per cent. The future output was to be derived from both advance work and pillars in about equal proportions. The output of mine should be considered in connection with that of the Angle mine.

For chemical analyses of this coal see part I of this bulletin, p. 265.

NORTHFORK. NORTHFORK MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8776, 8777 (p. 266).

Mine.—Northfork; Norfolk-Western district; a drift mine at Northfork, on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness ranges as mined from 5 to 6⅓ feet; roof, hard gray shale, underlain with about 18 inches of "draw slate," which did not in all places fall with the coal; floor, hard shaly underclay, between which and the coal there is in places a layer of soft clay, which tended to mix with the coal in loading.

The bed was measured and sampled at two points on August 13, 1909, by H. M. Wolflin, as described below:

Sections of coal bed in Northfork mine at Northfork.

Section	A		B	
Laboratory No	8776		8777	
Roof, hard gray shale (quality variable) and "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*
Hard bright coal	0	7¾	..	..
Soft bright coal	..	..	0	6
Sulphurous coal	[a]0	1	..	..
Hard gray coal	..	..	0	½
Bright mottled coal	0	7½	0	7
Hard gray coal	0	3	0	1
Soft coal (in places mother-coal streaks)	0	10¼	0	10
Bony coal	[a]0	3½	0	2
Soft coal (mother-coal streaks)	0	11	..	..
Gray coal	0	4	1	4
Soft coal (mother-coal streaks)	2	4	1	5½
Floor, soft clay or hard shaly underclay.				
Thickness of bed	6	4	5	0
Thickness of coal sampled	5	11½	5	0

[a] Not included in sample.

Section A (sample 8776) was cut from the face of Burke entry, about 900 feet from drift mouth.

Section B (sample 8777) was cut from pillar 11 on dip entry.

Notes.—The coal was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple, which supplied the Norfolk & Western coaling station only, was connected to the bins over the track by a long chute, and was not equipped with screens. This mine was connected with the Piney mine, and coal was sometimes hauled through the mine and dumped from the Piney tipple, but this was not being done in August, 1909, when the mine was sampled. The daily output at that time averaged about 70 tons, and 122 tons was a maximum day's run. The entire output at that time went to the railroad coaling station. The future tonnage was to be derived almost entirely from pillars, for the mine was nearing exhaustion. The output of mine should be considered in connection with that of the Piney mine.

For chemical analyses of this coal see part I of this bulletin, p. 266.

PAGETON. PAGE NOS. 1, 2, AND 3 MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8521, 8522, 8523, 8541, 8678, 8535, 8536, 8537, 8684, 8538, 8539, 8540, 8685 (p. 266).

Mines.—Page Nos. 1, 2, and 3; Norfolk-Western district; drift mines near Pageton, on the Tug Fork Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, nearly uniform, ranging as mined from 7 feet 6 inches to 8 feet 6 inches; dip, 2¼° NW.; roof, gray shale, about 15 feet thick with projecting knobs; below the main roof is 4 to 8 inches of "draw slate" which does not fall immediately with the coal; above the gray shale there is sandstone; floor, hard underclay; cover, for the most part, 200 to 400 feet thick.

The bed was measured and sampled at ten points by R. Y. Williams on July 29 and 30, 1909, as described below:

Sections of coal bed in Page No. 1 mine, 1¼ miles north of Pageton.

Section	A		B		C		D	
Laboratory No.	8521		8522		8523		8541	
Roof, gray shale and "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	5½	0	6½	0	7	0	6
Sulphur band	[a]0	1	[a]0	1	[a]0	1	[a]0	2
Soft bright coal (mother-coal streaks)	1	3	1	11½	1	1¾	0	10
Hard gray to bony coal	0	3	[a]0	1½	0	3	0	4
Soft bright coal	0	7	0	6	0	8	0	6
Hard dense gray coal	0	1	..	..	..	..	..	..
Hard gray to bony coal	[a]0	2	0	1	0	3½	[a]0	2
Soft bright coal (mother-coal streaks)	0	5½	1	1	1	6	0	6½
Hard gray to bony coal	0	3½	0	2	[a]0	2	0	3
Soft bright coal	1	1	0	8	0	6½	1	8
Harder gray coal	0	2½	0	3	0	2½	0	3
Soft coal	2	7	1	11	2	1	2	2
Floor, hard underclay.								
Thickness of bed	7	6	7	4½	7	6¼	7	4½
Thickness of coal sampled	7	3	7	2	7	3¼	7	½

[a] Not included in sample.

Section A (sample 8521) was cut from a pillar in room 32 on right cross entry 1, 2,700 feet from drift mouth.

Section B (sample 8522) was cut from the face of room 33 on right cross entry 4, 3,300 feet from drift mouth.

Section C (sample 8523) was cut from the face of room 21 on right cross entry 6, 3,800 feet from drift mouth.

Section D (sample 8541) was cut from the face of left entry 6, 2,400 feet from drift mouth.

A composite sample was made by mixing face samples 8522, 8523, and 8541 for an ultimate analysis, the results of which are shown under laboratory No. 8678.

Sections of coal bed in Page No. 2 mine, ½ mile southwest of Pageton.

Section	A		B		C	
Laboratory No	8537		8536		8535	
Roof, gray shale and draw slate, 4 to 8 inches.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright coal	0	6½	0	6	0	7
Sulphur band	[a] 0	½	[a] 0	½	[a] 0	½
Soft bright coal (mother-coal streaks)	2	½	1	3	1	2½
Hard gray coal	0	1	0	2½	0	1½
Soft bright coal	0	2	1	3	0	11
Bone	[a] 0	3	Trace.		[a] 0	3
Soft bright coal (mother-coal streaks)	..	..	..	..	0	5½
Hard gray coal	..	..	0	4	0	1
Soft bright coal	0	2	2	8½	1	4
Hard gray coal	0	3	[a] 0	8¾	0	1¾
Soft bright coal (mother-coal streaks)	4	3	1	5½	2	9
Floor, hard underclay.						
Thickness of bed	7	9½	8	5¾	7	10¾
Thickness of coal sampled	7	6	7	8½	7	7¼

[a] Not included in sample.

Section A (sample 8537) was cut from the face of cross entry 2, 1,700 feet from drift mouth.

Section B (sample 8536) was cut from the face of the main entry, 1,600 feet from drift mouth.

Section C (sample 8535) was cut from the face of room 9 on cross entry 1, 1,200 feet from drift mouth.

A composite sample was made by mixing face samples 8535, 8536, and 8537 for an ultimate analysis, the results of which are shown under laboratory No. 8684.

Sections of coal bed in Page No. 3 mine, 2 miles north of Pageton.

Section	A		B		C	
Laboratory No	8540		8539		8538	
Roof, gray shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	6½	0	6½	0	7
Sulphur and bony band	[a] 0	2	[a] 0	3	[a] 0	2
Soft bright coal (mother-coal streaks)	1	0	0	11	2	4
Gray to bony coal	0	6	0	3	[a] 0	1
Soft bright coal (mother-coal streaks)	0	8½	0	10	1	2
Bone to hard gray coal	[a] 0	3	[a] 0	2½	..	..
Soft bright coal (mother-coal streaks)	2	0	1	2	0	6
Hard gray coal	0	4	0	3	0	3
Soft bright coal	1	10	2	7	1	0
Floor, hard underclay.						
Thickness of bed	7	4	7	0	6	1
Thickness of coal sampled	6	11	6	6½	6	10

[a] Not included in sample.

Section A (sample 8540) was cut from the face of the main entry, 2,300 feet from drift mouth.

Section B (sample 8539) was cut from the face of room 9, on cross entry 4, 1,700 feet from drift mouth.

Section C (sample 8538) was cut from the face of right cross entry 2, 2,100 feet from drift mouth.

A composite sample was made by mixing face samples Nos. 8538, 8539, and 8540 for an ultimate analysis, the results of which are shown under laboratory No. 8685.

Notes.—The coal at these mines was undercut with puncher machines in bottom part of bed and was shot down with black powder and a short-flame explosive. The tipple had bar screens with 3-inch and ⅝-inch spaces and shaker screens with 1¼-inch, ⅝-inch, ½-inch, and ⅜-inch holes. The screenings, which amounted to 20 per cent of the whole output, were coked in beehive ovens. The coal was picked on car by four trimmers. The daily output at time of sampling in July, 1909, averaged 1,600 tons, and 2,000 tons was a maximum day's run. It was planned to increase the output, which was to be derived from advance work and pillars in about equal proportions.

For chemical analyses of this coal, see part I of this bulletin, p. 266.

POWHATAN. POWHATAN MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8327, 8328, 8329, 8448, 8449, 8450, 8427 (p. 267).

Mine.—Powhatan; Norfolk & Western district; a drift mine at Powhatan, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 6 feet 2 inches to 9 feet; roof, sandstone, underlain with "draw slate"; floor, hard slaty underclay; cover, for the most part, about 300 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay on July 20, 1909, as described below:

Sections of coal bed in Powhatan mine at Powhatan.

Section	A		B		C		D		E		F	
Laboratory No.	8329		8328		8327		8448		8449		8450	
Roof, sandstone, draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bright "top coal"	0	11	0	11½	[a] 1	0	0	9½	0	11¼	[a] 1	0
Bony and sulphur band	[a] 0	3	[a] 0	1½	[a] 0	2	[a] 0	2	[a] 0	3½	[a] 1	2
Soft bright coal (mother-coal streaks)	0	8	1	7	..	..	1	3¼	0	10	1	8¼
Medium hard bright coal	0	4	..	..	..	..	..	..	0	9	..	..
Bony coal	[a] 0	4	[a] 0	5	..	..	..	..	[a] 0	3¾	[a] 0	3¼
Soft bright coal (mother-coal streaks)	..	..	..	..	0	10	..	..	0	11¾	1	0
Hard gray coal	..	..	..	..	0	4	0	¾	0	2¼	..	..
Soft bright coal	0	9	1	0	0	5	0	2	0	4	..	..
Hard gray coal	0	4	0	3	[a] 0	4	[a] 0	3	0	2¼	0	2¼
Soft bright coal (mother-coal streaks)	0	5½	0	3½	1	0	1	1	0	2¾	0	5
Hard gray coal	0	3	0	3	0	4	[a] 0	1½	0	1¼	0	2½
Soft bright coal (mother-coal streaks)	2	5	2	7	2	11	2	7¼	2	4¾	2	5¼
Floor, hard slaty underclay.												
Thickness of bed	6	8½	7	5½	7	4	6	6¼	7	6½	8	4½
Thickness of coal sampled	6	1½	6	11	5	10	5	11¾	6	11¼	5	11¼

[a] Not included in sample.

Section A (sample 8329) was cut from a pillar of room 3 on left entry 5, 1,800 feet from drift mouth.

Section B (sample 8328) was cut from the face of left entry 8½, 2,400 feet from drift mouth.

Section C (sample 8327) was cut from the face of left entry 12, 5,700 feet from drift mouth.

Section D (sample 8448) was cut from a pillar in room 9 on right entry 7, 3,300 feet from drift mouth.

Section E (sample 8449) was cut from the face of room 25 on right entry 8½, 3,800 feet from drift mouth.

Section F (sample 8450) was cut from the face of right entry 12, 5,600 feet from drift mouth.

A composite sample was made by mixing samples 8327, 8328, 8449, and 8450 for an ultimate analysis, the results of which are shown under laboratory No. 8427.

Notes.—The coal at this mine was undercut both by hand and with chain machines in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with 3-inch and ¼-inch spaces, and revolving screens with 1¼-inch, 1-inch, and ¼-inch holes. The screenings, which formed 25 per cent of the whole output, were coked in beehive ovens. The coal was picked on car by six trimmers. The daily output at time of inspection and sampling in July, 1909, averaged 900 tons, and 1,650 tons was a maximum day's run. It was planned to increase the output, which was to be derived from advance work and pillars in equal proportions.

For chemical analyses of this coal, see part I of this bulletin, p. 267.

RODERFIELD. PREMIER POCAHONTAS NO. 1 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 649, 650 (p. 267).

Mine.—Premier Pocahontas No. 1; Norfolk & Western district; a drift mine, three-fourths mile northwest of Premier (formerly known as Flanigan), or 6 miles southeast of Roderfield, on the Spice Creek branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Welch or No. 6. It is of Carboniferous age, Pocahontas formation. The bed as mined ranges in thickness from 3 feet 1 inch to 3 feet 7 inches. The coal is free from partings save for a characteristic gray splint which occurs near the top of the bed. The roof is of smooth hard shaly sandstone, variable in thickness. The floor is of hard smooth sandstone. Neither roof nor floor got mixed with the coal in loading. Miners and pickers had little difficulty in discarding the gray splint (shale).

The bed was measured and sampled at two points by P. M. Riefkin and A. A. Straub on April 30, 1910, as described below:

Sections of coal bed in Premier Pocahontas No. 1 mine, 6 miles southeast of Roderfield.

Section	A		B	
Laboratory No	650		649	
Roof, shaly sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	$5\frac{3}{4}$	0	$10\frac{1}{4}$
Mother coal (streak)	..	..	..	..
Splint [a]	..	..	0	$2\frac{3}{8}$
Coal	0	6	2	$\frac{3}{8}$
Gray splint [a]	0	4	..	..
Coal	2	$4\frac{1}{8}$	..	..
Floor, hard sandstone.				
Thickness of bed	3	$7\frac{7}{8}$	3	1
Thickness of coal sampled	3	$3\frac{7}{8}$	2	$10\frac{5}{8}$

[a] Not included in sample.

Section A (sample 650) was cut from face of right entry 1, off left entry 2, 1,150 feet southeast of drift mouth.

Section B (sample 649) was cut from face of right entry 3, off main heading, 1,300 feet south of drift mouth.

Notes.—The coal at this mine was undercut with hand pick in the lower part of the bed, and was shot down with black blasting powder. There were no screens, the entire output being shipped as run-of-mine coal. The coal was picked by two trimmers as it was loaded on the cars. At the time of sampling and inspection in April, 1910, the mine had a capacity of 200 tons per day, the average daily output being 125 tons, all of which was taken from advance work. Premier Nos. 1, 2, and 3 were practically new mines with a total of 3,000 acres of land. The output of mine should be considered in connection with that of Nos. 2 and 3 mines. Output of three mines in fiscal year 1910, 107,967 long tons.

For chemical analyses of this coal see part I of this bulletin, p. 267.

RODERFIELD. PREMIER POCAHONTAS NO. 2 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 651, 652 (p. 267).

Mine.—Premier Pocahontas No. 2; Norfolk & Western district; a drift mine, $\frac{1}{4}$ mile west of Premier (formerly known as Flanigan), or 6 miles southeast of Roderfield, on the Spice Creek branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Welch or No. 6. Carboniferous age, Sewell formation. The bed as mined ranges in thickness from 4 feet 2 inches to 4 feet 7 inches. The roof is of smooth sandstone of good quality and does not fall with the coal. The floor is of hard sandstone which did not get mixed with the coal in loading. The coal is free from partings save for a characteristic gray splint which occurs at variable distances from the top. The miners and pickers had little difficulty in discarding this gray splint (shale) in loading cars. Output of mine should be considered in connection with that of Nos. 1 and 3 mines.

The bed was measured and sampled at two points by P. M. Riefkin and A. A. Straub on April 30, 1910, as described below:

Sections of coal bed in Premier Pocahontas No. 2 mine, 6 miles southeast of Roderfield.

Section	A		B	
Laboratory No	651		652	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Bright coal	0	7¼	..	..
Coal	..	..	0	11½
Shale (streaks)	..	..	..	..
Bright coal	0	4¼	..	..
Splint (gray) [a]	0	¾	0	2¾
Coal	1	5	3	⅜
Mother-coal streaks	..	..	..	..
Coal	1	11¾	..	..
Floor, sandstone.				
Thickness of bed	4	5	4	2⅝
Thickness of coal sampled	4	4¼	3	11⅞

[a] Not included in sample.

Section A (sample 651) was cut from face of slope of left entry 2, 1,600 feet east of drift mouth.

Section B (sample 652) was cut from face of left entry 1, 1,400 feet east of drift mouth.

Notes.—Notes given under Premier Pocahontas No. 1 mine apply, except that the tipple of this mine was provided with ¾-inch and 3-inch bar screens. The mine had a capacity of 300 tons per day, the average daily output at the time of sampling being 250 tons, all of which was taken from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 267.

Roderfield. Premier Pocahontas No. 3 Mine.

Sample.—Bituminous coal, Pocahontas field; analyses Nos. 653, 654, 655 (p. 267).

Mine.—Premier Pocahontas No. 3; Norfolk & Western district; a drift mine, 1 mile northeast from Premier (formerly known as Flanigan), or 7 miles southeast of Roderfield, on the Spice Creek Branch of the Norfolk & Western Railway.

Coal bed.—Same as for Pocahontas No. 1 mine (p. 1007).

The bed was measured and sampled at two points by P. M. Riefkin and A. A. Straub on April 30, 1910, as described below:

Sections of coal bed in Premier Pocahontas No. 3 mine, 7 miles southeast of Roderfield.

Section	A		B	
Laboratory No	653		654	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal (soft)	0	11¾	0	3½
Splint (gray)	[a] 0	3½	..	..
Coal (bright)	..	..	0	6½
Splint	..	..	[a] 0	4⅝
Coal (hard, gray)	2	3	1	6½
Coal (bright)	0	10	1	1
Floor, sandstone.				
Thickness of bed	4	4¼	3	10⅛
Thickness of coal sampled	4	¾	3	5½

[a] Not included in sample.

Section A (sample 653) was cut from the face of slope of left entry 1, 900 feet northeast of drift mouth.

Section B (sample 654) was cut from face of left entry 2, 1,350 feet east of drift mouth.

A composite sample was made by mixing the face samples 649, 650, 651, 652, 653, and 654 for an ultimate analysis, the results of which are shown under laboratory No. 655.

Notes.—Notes given under Premier Pocahontas No. 2 mine apply to this mine. Output of mine should be considered in connection with that of Nos. 1 and 2 mines.

For chemical analyses of this coal, see part I of this bulletin, p. 268.

SWITCHBACK. DELTA MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8411, 8412, 8413, 8414, 8415, 8416, 8417 (p. 268).

Mine.—Delta; Norfolk & Western district; a drift mine one-fourth mile northeast of Switchback, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The acreage in this mine is separated into two divisions by what is known locally as the "Norfolk Split," which may be described as a thickening of the so-called "sulphur band" into a rock parting. The thickness of the coal as mined ranges from 5 feet 3 inches under the above split to 8 feet 10 inches in the undisturbed portions. Main roof is of rather soft gray shale, between which and the coal lies a draw slate about 24 inches thick, which tends to fall and mix with the coal; floor, hard gray shale with smooth surface; cover, for the most part, 150 to 400 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay, on July 26, 1909, as described below:

Sections of coal bed in Delta mine, ¼ mile northeast of Switchback.

Section	A		B		C		D		E		F	
Laboratory No	8411		8412		8413		8414		8415		8416	
Roof, gray shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal (mother-coal streaks)	0	11	0	11	[a] 0	11	..	..	..	..	1	0
Sulphur band	[a] 0	3	[a] 0	1½	[a] 0	2	..	..	..	..	[a] 0	2½
Soft bright coal (mother-coal streaks)	1	3	1	3½	1	4½	1	6½	1	7	1	7
Hard to soft gray coal	1	10	0	3	0	2½	..	..	..	..	0	2½
Soft bright coal	..	..	0	5½	..	..	..	..	..	..	0	3
Hard gray coal to bone	0	2	0	4	..	..	..	..	..	..	[a] 0	4
Soft to hard bright coal	0	1½	0	4	0	5	0	10	..	..	1	9
Hard gray coal to bone	0	1½	..	..	0	7	[a] 0	5½	[a] 0	3	[a] 0	3
Soft bright coal (mother-coal streaks)	1	10	1	10	1	10	1	10½	1	10	0	3
Hard gray to bony coal	[a] 0	3	[a] 0	4	[a] 0	6	[a] 0	3	[a] 0	3	0	½
Soft bright coal (mother-coal streaks)	2	2	2	8	2	3	2	2½	2	6	2	4
Floor, hard shale.												
Thickness of bed	8	11	8	6½	8	3	7	2	6	5	8	2½
Thickness of coal sampled	8	5	8	1	6	8	6	5½	5	11	7	5

[a] Not included in sample.

Section A (sample 8411) was cut from the chain pillar on cross entry 3, 4,500 feet from drift mouth.

Section B (sample 8412) was cut from the face of entry 8, 7,000 feet from drift mouth.

Section C (sample 8413) was cut from the face of entry 8–2, 4,500 feet from drift mouth.

Section D (sample 8414) was cut from the face of the main entry, 7,800 feet from drift mouth.

Section E (sample 8415) was cut from the face of the dip entry, 7,000 feet from drift mouth.

Section F (sample 8416) was cut from a pillar in room 3 on cross entry 5, 2,000 feet from drift mouth.

A composite sample was made by mixing samples 8411, 8412, 8413, 8414, 8415, and 8416 for an ultimate analysis, the results of which are shown under laboratory No. 8417.

Notes.—The coal at this mine was undercut by chain machines in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with 2-inch spaces. Ordinarily the screenings were coked in beehive ovens, but at the time of sampling (July, 1909) the ovens had been out of blast for 60 days, and the entire output was shipped as run-of-mine coal. The daily average output was about

1,200 tons, and 2,048 tons was the maximum day's output. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal, see part I of this bulletin, p. 268.

SWITCHBACK. SHAMOKIN MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8398, 8399, 8400, 8441, 8442, 8443, 8474, 8475 (pp. 268, 269).

Mine.—Shamokin; Norfolk & Western district; a drift mine, ½ mile southeast of Switchback, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 7 to 8 feet; roof, strong bedded sandstone, underlain with 8 to 14 inches of draw slate, which fell with the coal in the rooms, in the entries 14 inches of top coal was left up as the immediate roof; floor, hard clay with smooth surface; cover, for the most part, 120 to 300 feet thick.

The bed was measured and sampled at six points by R. Y. Williams and A. C. Ramsay on June 21, 1909, as described below:

Sections of coal bed in Shamokin mine, ½ mile southeast of Switchback.

Section	A		B		C		D		E		F	
Laboratory No.	8441		8442		8443		8398		8399		8400	
Roof, sandstone and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft, bright coal	0	10	1	0	0	10½	0	11	[a] 0	10	0	11
Sulphur band	[a] 0	¾	[a] 0	1¼	[a] 0	2½	[a] 0	2	[a] 0	2	[a] 0	2
Soft, bright coal (mother-coal streaks).	1	5	1	¾	1	1¾	1	9½	1	8	1	7
Hard, gray coal	0	1¾	0	6½	0	7	..	..	..	..	0	3
Soft, bright coal (mother-coal streaks).	0	5	0	2¾	..	..	..	..	..	..	0	4
Bone	[a] 0	3¼	[a] 0	4½	[a] 0	7½	[a] 0	3	[a] 0	3½	[a] 0	4
Soft, bright coal	0	1½	..	..	..	..	..	..	..	..	..	..
Hard, gray coal	0	1¼	..	..	..	..	..	..	..	..	..	..
Soft, bright coal (mother-coal streaks).	1	9½	1	10	1	6	2	2½	2	3	2	0
Hard, gray coal to bone	0	1½	0	4	[a] 0	1¼	0	1½	..	..	..	..
Soft, bright coal	0	2	0	2¾	0	1¾	0	2½	..	..	..	..
Hard, gray coal	0	2½	0	1¼	0	1¼	0	2	0	3	..	..
Soft, bright coal	2	4¼	2	¾	2	7¾	2	3	2	0	2	2½
Floor, hard clay.												
Thickness of bed	8	¼	7	10½	7	11¼	8	1	7	5½	7	9½
Thickness of coal sampled	7	8¼	7	4¾	7	0	7	8	6	2	7	3½

[a] Not included in sample.

Section A (sample 8441) was cut from a pillar on the St. Louis entry, 4,200 feet from drift mouth.

Section B (sample 8442) was cut from face of room 4 on new drift, 3,000 feet from drift mouth.

Section C (sample 8443) was cut from a pillar in room 14 on the Coney Island entry, 2,000 feet from drift mouth.

Section D (sample 8398) was cut from the face of the old main entry, 6,400 feet from drift mouth.

Section E (sample 8399) was cut from the face of entry 14-1, 6,400 feet from drift mouth.

Section F (sample 8400) was cut from the chain pillar at room 8 on left entry 12.

A composite sample was made by mixing face and pillar samples 8398, 8399, 8400, and 8442 for an ultimate analysis, the results of which are shown under laboratory No. 8474. A composite sample was also made by mixing the pillar samples 8441 and 8443 for an ultimate analysis, the results of which are shown under laboratory No. 8475.

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed and was shot down with black powder. The tipple was equipped with bar screens with 2-inch and 4-inch spaces. The screenings, amounting to 10 per cent of the whole output, were coked in beehive ovens. The coal was picked on the car by three trimmers. The daily output at time of sampling in 1909 averaged 1,000 tons, and 1,600 tons was a maximum day's run. The future output was to be derived from both advance work and pillars in about equal proportions.

For chemical analyses of this coal, see part I of this bulletin, pp. 268, 269.

SWITCHBACK. LICK BRANCH MINE.

Sample.—Semibituminous coal; Pocahontas field; analysis No. 5706 (Jamestown No. 12) and analyses Nos. 8378, 8379, 8380, 8457, 8358, 8359, 8458 (p. 269).

Mine.—Lick Branch; a drift mine, in the Norfolk & Western district, ¾ mile south of Switchback, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness of the bed varies from 7½ to 9½ feet. It lies nearly flat. The roof is a hard shale, 2 to 8 inches of which is "draw slate." There is a cap rock of sandstone. The floor is a fairly hard underclay with a smooth surface, to which the coal sticks in places.

The bed was measured and sampled at five points by R. Y. Williams and G. S. Rice on July 19, 1909, as described below:

Sections of coal bed in Lick Branch mine, ¾ mile south of Switchback.

Section	A		B		C		D		E	
Laboratory No	8378		8379		8380		8359		8358	
Roof, hard shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, hard	..	..	..	..	..	..	0	10	0	10
Soft, bright coal	0	7	0	11	0	10½	..	..	..	..
Sulphur and bone [a]	0	½	0	1	0	1	0	2	0	2
Coal (mother-coal streaks)	..	..	..	..	..	..	1	3	1	11
Soft, bright coal	0	4½	1	4	1	11½	..	..	..	..
Gray, hard coal	0	1	0	2	..	..	0	3	..	..
Soft, bright coal	0	9	0	3½	..	..	0	5	..	..
Soft, bright coal (mother-coal streaks)	1	4	..	..	..	..	..	..	..	..
Bony coal [a]	0	3	0	4½	0	3½	0	4	0	4
Soft, bright coal (mother-coal streaks)	..	..	2	2	1	9½	..	..	..	..
Soft, slightly grayish coal	..	..	..	..	0	5	..	..	..	..
Soft, bright coal	1	10	..	..	0	4	1	11	1	9
Hard, gray coal	0	2	0	4	0	1½	0	2	0	4
Soft, bright coal	2	7½	2	8	2	5	2	9½	2	4
Floor, smooth shale.										
Thickness of bed	8	½	8	4	8	3½	8	1½	7	8
Thickness of coal sampled	7	9	7	10½	7	11	7	7½	7	2

[a] Not included in sample.

Section A (sample 8378) was cut from face of room 3, off entry 2, 1,500 feet from drift mouth.

Section B (sample 8379) was cut from face of straight entry 8, 2,500 feet from drift mouth.

Section C (sample 8380) was cut from face of room 19, entry 8-1, 3,500 feet from drift mouth.

Section D (sample 8359) was cut from chain pillar, left entry 9, opposite room 28, 6,200 feet southeast of drift mouth.

Section E (sample 8358) was cut from pillar of room 13, off left entry 9, 5,200 feet southeast of drift mouth.

A composite sample was made by mixing the face samples 8378, 8379, and 8380 for an ultimate analysis, the results of which are shown under laboratory No. 8457.

A composite sample was also made by mixing the pillar samples 8358 and 8359 for an ultimate analysis, the results of which are shown under laboratory No. 8458.

The bed was also measured and sampled at one point in the mine by K. M. Way on November 6, 1907, as shown on the following page.

Section of coal bed in the Lick Branch mine, ¾ mile north of Switchback.

Laboratory No	5706	
	Ft.	*in.*
Roof, shale.		
Coal	1	8¾
Mother coal	0	½
Coal	0	3
Mother coal	0	⅜
Coal	0	2¾
Mother coal	0	½
Coal	0	7¼
Bony coal [a]	0	3
Coal	5	6½
Floor, shale.		
Thickness of bed	8	8⅝
Thickness of coal sampled	8	5⅝

[a] Not included in sample.

The section was measured in the face of entry 9, 5,280 feet west of the drift mouth.

Notes.—The coal at this mine was undercut with chain machine in bottom part of bed, and was shot down with black blasting powder. The tipple was equipped with bar and revolving screens with 6-inch, 4-inch, and 2-inch openings. Seventy-five per cent of the coal was screened, the screenings being coked. The coal was picked on the car by five trimmers. The daily output averaged 500 tons and a maximum day's run was 1,500 tons. Normally 450 tons of coal was coked at the plant. The future output was to be derived in equal proportions from advance work and pillars. The output was to be increased.

For results of briquetting tests of this coal, see U. S. Geol. Survey Bull. 385, p. 29.

For chemical analyses see part I of this bulletin, p. 269; also U. S. Geol. Survey Bull. 362, p. 20.

TWIN BRANCH. TWIN BRANCH MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8850, 8851, 8852, 8853, 8935 (p. 269).

Mine.—Twin Branch; Norfolk & Western district; a drift mine at Twin Branch, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The coal varies in thickness from 3 feet to 3 feet 8 inches. It has some mother-coal streaks, but practically no impurities. Roof, hard gray shale, having in places 2 inches of draw slate that comes down with the coal; floor, hard underclay with a smooth surface.

The bed was measured and sampled at four points by J. W. Groves on August 13, 1909, as described below:

Sections of coal bed in Twin Branch mine at Twin Branch.

Section	A		B		C		D	
Laboratory No	8850		8851		8852		8853	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard gray shale.								
Coal and shale [a]	0	2	..	..	..	..	..	..
Coal	0	6	2	1½	1	½	2	0
Mother coal	0	¼	0	¼	0	½	0	¼
Coal	2	5	0	4½	1	6	0	4
Shale and mother coal [a]	..	..	0	3	..	..	..	..
Mother coal	0	½	..	..	..	..	0	½
Pyrites [a]	..	..	..	..	0	¼	..	..
Coal	0	6¼	0	4¾	0	6	0	9¼
Mother coal	..	..	..	..	0	1½	..	..
Coal	..	..	..	..	0	2½	..	..
Floor, hard underclay.								
Thickness of bed	3	8	3	2	3	5¼	3	2
Thickness of coal sampled	3	6	2	11	3	5	3	2

[a] Not included in sample.

Section A (sample 8850) was cut from a pillar on right entry 4, off main entry, 2,600 feet northeast of drift mouth.

Section B (sample 8851) was cut from the face of right entry 8, off main entry, 3,800 feet northeast of the drift mouth.

Section C (sample 8852) was cut from the face of main entry, 3,200 feet northeast of the drift mouth.

Section D (sample 8853) was cut from the face of entry 32, 4,100 feet northeast of the drift mouth.

A composite sample was made by mixing the face samples 8851, 8852, and 8853 for an ultimate analysis, the results of which are shown under laboratory No. 8935.

Notes.—The coal at this mine was undercut by punchers and by hand and was shot down with black powder. The tipple was provided with bar screens with 1¼-inch spaces. The coal passing through this screen was sold as "smithing" coal. The coal was cleaned by two trimmers as it was loaded on the cars. The tipple had a storage-bin capacity of 100 tons. The average daily output of the mine at time of sampling in 1909 was 450 tons, 55 per cent of which was from advance work. About 85 per cent of the coal was sold as run-of-mine. The output was to be increased with the demand. The company has at this place five mines, which had a combined capacity of 1,400 tons and were capable of producing 2,000 tons.

For chemical analyses of this coal, see part I of this bulletin, p. 269.

TWIN BRANCH. J. B. NO. 2 MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8854, 8855, 8856, 8857, 8858, 8936 (p. 270).

Mine.—J. B. No. 2; Norfolk & Western district; a drift mine ¼ mile west of Twin Branch, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The coal varies in thickness from 3 to 4 feet. It has some mother-coal streaks. The roof is a hard gray shale. The floor is a hard underclay with smooth surface.

The bed was measured and sampled at five points by J. W. Groves on August 13, 1909, as described below:

Sections of coal bed in J. B. No. 2 mine, ¼ mile west of Twin Branch.

Section	A		B		C		D		E	
Laboratory No.	8854		8855		8856		8857		8858	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	6	2	10	0	8	3	0	2	1½
Mother coal	0	¼	0	½	..	..	0	½	0	½
Flake sulphur	..	..	..	..	[a] 0	½	..	..	..	..
Coal	2	8¼	0	3	1	7½	0	4	0	6½
Mother coal	..	..	..	..	0	½	..	..	0	1
Coal	..	..	..	..	0	8	..	..	0	8
Floor, hard underclay.										
Thickness of bed	3	2½	3	1½	3	½	3	4½	3	5½
Thickness of coal sampled	3	2½	3	1½	3	0	3	4½	3	5½

[a] Not included in sample.

Section A (sample 8854) was cut from the face of left entry 4, 1,500 feet west of the drift mouth.

Section B (sample 8855) was cut from the face of the main entry, 2,300 feet west of the drift mouth.

Section C (sample 8856) was cut from the face of right entry 6, off entry 7, 2,400 feet northwest of the drift mouth.

Section D (sample 8857) was cut from the face of right entry 1, off entry 7, 2,600 feet northwest of the drift mouth.

Section E (sample 8858) was cut from a pillar in left entry 1, off the main entry, 600 feet southwest of the drift mouth.

A composite sample was made by mixing the face samples 8854, 8855, 8856, and 8857 for an ultimate analysis, the results of which are shown under laboratory No. 8936.

Notes.—The coal at this mine was undercut with electric machines and air punchers and was shot down with black powder. The tipple was equipped with bar screens with 1¼-inch, 2-inch, and 3½-inch openings. The coal was picked by two trimmers as it was loaded on the cars. The capacity of the mine was 700 tons, the output being 400 tons daily. The future output was to be derived from advance work and pillars in about equal proportions. The company had five mines at this place, all working in the Sewell bed. The combined output was 1,400 tons, and the capacity 2,000 tons.

For chemical analyses of this coal see part I of this bulletin, p. 270.

VIVIAN. BOTTOM CREEK MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8571, 8581, 8582, 8583, 8584, 8673, 8674 (p. 271).

Mine.—Bottom Creek; Norfolk and Western district; a drift mine at Vivian, on the main line of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness ranges as mined from about 5½ to 6¼ feet; roof, treacherous gray shale, about 15 feet thick, between which and the coal there is about 2 to 10 inches of "draw slate"; the whole is capped with sandstone; floor, hard gray shaly underclay, with rather rough surface, but does not mix with the coal in loading.

The bed was measured and sampled at three points on July 31, 1909, by J. J. Rutledge, and at two points on August 2, 1909, by J. J. Rutledge and H. M. Wolflin, as described below:

Sections of coal bed in Bottom Creek mine at Vivian.

Section	A		B		C		D		E	
Laboratory No	8571		8584		8581		8582		8583	
Roof, treacherous gray shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	8½	0	4½	2	1	0	3	0	3½
Sulphurous bone [a]	..	..	0	¼	..	..	0	½	0	¼
Bony coal	0	1½	..	..	..	..	..	..	..	..
Coal	..	..	1	5	..	..	0	11	1	7½
Gray coal	..	..	..	..	..	..	0	2	..	..
Coal	..	..	..	..	..	..	0	9½	..	..
Bone (in places with slate) [a]	0	2¾	0	4	0	2½	0	3½	0	5
Bright hard coal	1	6½	..	..	..	..	..	..	..	..
Hard gray coal	0	2	..	..	..	..	..	..	..	..
Soft coal (mother-coal streaks)	2	1½	..	..	..	..	..	..	..	..
Coal	..	..	3	6	3	9½	3	2½	3	6
Floor, hard shaly underclay.										
Thickness of bed	5	10¾	5	7¾	6	1	5	8	5	10¼
Thickness of coal sampled	5	8	5	3½	5	10½	5	4	5	5

[a] Not included in sample.

Section A (sample 8571) was cut from pillar 8, opposite siding on cross entry 1, about 550 feet southeast of drift mouth.

Section B (sample 8584) was cut from chain pillar 8 in entry opposite room 45, about 9,300 feet northeast of drift mouth.

Section C (sample 8581) was cut from last room off main entry, about 7,300 feet northeast of drift mouth.

Section D (sample 8582) was cut from face of cross entry 12, about 8,700 feet northeast of drift mouth.

Section E (sample 8583) was cut from last break-through in cross entry 9, about 12,500 feet northeast of drift mouth.

A composite sample was made by mixing pillar samples 8571 and 8584 for an ultimate analysis, the results of which are shown under laboratory No. 8673.

A composite sample was also made by mixing face samples 8581, 8582, and 8583 for an ultimate analysis, the results of which are shown under laboratory No. 8674.

Notes.—The coal at this mine was undercut principally by hand in bottom part of bed, and was shot down with black powder or with a permissible explosive. The tipple had bar screens with ¼-inch and 3-inch openings, and revolving screens with ½-inch and 1¼-inch openings. The egg coal was picked on a table by three trimmers; the other sizes were picked in the car by four trimmers. The daily output averaged about 750 tons (approximately 80 per cent of which was shipped as run-of-mine coal); 1,000 tons was a maximum day's run.

This mine had a large territory opened up, and the future output was to come largely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 271.

VIVIAN. TIDEWATER MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8573, 8574, 8575, 8576, 8577, 8524, 8681, 8680 (p. 271).

Mine.—Tidewater; Norfolk & Western district; a drift mine at Vivian, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 5 to 5¾ feet; roof, massive gray "kettle bottom" shale, about 2 to 4 feet in thickness, with a cap rock of sandstone; floor, massive hard blue underclay (shaly in places) with smooth surface.

The bed was measured and sampled at six points on July 30, 1909, by J. J. Rutledge and H. M. Wolflin, as described below:

Sections of coal bed in Tidewater mine, at Vivian.

Section	A		B		C		D		E		F	
Laboratory No.	8573		8574		8575		8576		8577		8524	
Roof, massive "kettle-bottom" shale	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard coal (streaks of sulphur)	1	7½	..	..	..	..	..	..	..	..	..	..
Bright coal	..	..	0	11	0	11	1	3½	1	3½	1	8½
Hard gray coal	..	..	0	1¼	..	..	..	..	..	..	..	..
Dull waxy coal	..	..	..	..	0	1	..	..	..	..	..	..
Bright coal	..	..	0	8½	0	9¾	..	..	..	..	..	..
Mother coal	..	..	..	..	..	..	0	¾	0	¾	..	..
Bright coal	..	..	..	..	..	..	0	3	0	7	..	..
Mother coal	..	..	..	..	..	..	0	¼	..	..	..	..
Coal	..	..	..	..	..	..	0	3½	..	..	..	..
Bony coal [a]	0	3¼	0	3¼	..	2¾	0	3	0	3½	0	3
Bright coal	..	..	0	10½	1	½	..	..	..	..	0	6½
Mother coal	..	..	..	..	..	..	..	..	..	..	0	¼
Bright coal	..	..	..	..	..	..	..	..	..	..	..	..
Coal (mother-coal streaks)	0	9½	..	..	..	..	..	..	..	..	..	..
Hard gray coal	0	1¾	0	2	0	2	..	..	..	..	..	..
Bright coal	0	3	0	3	..	..	3	1½	3	2	2	6½
Hard gray coal		9¼	0	3½	..	..	..	..	..	..	..	..
Soft coal (mother-coal streaks)	1	5¼	2	0	2	1½	..	..	..	..	..	..
Floor, hard blue underclay.												
Thickness of bed	5	3½	5	7	5	4½	5	3½	5	4¾	5	¾
Thickness of coal sampled	5	¼	5	3¾	5	1¾	5	½	5	1¼	4	9¾

[a] Not included in sample.

Section A (sample 8573) was cut from pillar 2, off cross entry 1.

Section B (sample 8574) was cut from chain pillar, near room 16, in cross entry 3, off main entry.

Section C (sample 8575) was cut from pillar 10, off cross entry 9, off main entry.

Section D (sample 8576) was cut from face of main entry.

Section E (sample 8577) was cut from face of north entry 3, off cross entry 11.

Section F (sample 8524) was cut from face of north entry 7, off cross entry 10.

A composite sample was made by mixing pillar samples Nos. 8573, 8574, and 8575 for an ultimate analysis, the results of which are shown under laboratory No. 8681 (p. 271).

A composite sample was also made by mixing face samples Nos. 8576, 8577, and 8524 for an ultimate analysis, the results of which are shown under laboratory No. 8680 (p. 271).

Notes.—The coal at this mine was undercut entirely by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with ½-inch openings. The slack was coked in beehive ovens. Of the entire output about 75 per cent was shipped as run-of-mine coal. The coal was picked on belt by four trimmers and on the car by two trimmers. The daily output averaged about 1,000 tons, and 1,500 tons was a maximum day's run. The future output was to be derived from both advance work and pillars, probably 60 per cent of the coal coming from the latter.

For chemical analyses of this coal see part I of this bulletin, p. 271.

WEST VIVIAN. KING MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8647, 8648, 8649, 8688, 8694, 8695, 8723 (p. 271).

Mine.—King; Norfolk & Western district; a slope mine (slope 740 feet long, 28 degrees from horizontal) ½ mile west of West Vivian, on the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness as mined, from 5½ to 6½ feet; roof, gray shale, about 2½ feet thick, capped with sandstone. Between the shale and the coal there is sometimes about 6 inches of "draw slate" or "muck;" floor, hard gray shaly underclay with smooth surface.

The bed was measured and sampled at six points on August 3, 4, and 5, 1909, by G. S. Rice, J. J. Rutledge, and H. M. Wolflin, as described below:

Sections of coal bed in King mine, ½ mile west of West Vivian.

Section	A		B		C		D		E		F	
Laboratory No.	8688		8694		8695		8647		8648		8649	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Hard gray coal (mother-coal streaks)	1	7½	0	11½	1	7½	..	..	..	..	..	..
Gray coal (hard, splinty)	0	2½	0	½	..	..	..	..	..	..	..	..
Coal	..	..	..	..	..	..	1	10	1	9½	1	11
Mottled coal (mother-coal streaks)	..	..	0	7	..	..	..	..	..	..	..	..
Bony coal[a]	0	1¾	..	..	0	3	0	3½	0	3	0	2½
Gray bony coal, hard	..	..	0	2	..	..	..	..	..	..	..	..
Shale[a]	..	..	0	½	..	..	..	..	..	..	..	..
Soft coal (mother-coal streaks)	..	..	0	8	..	..	..	..	..	..	..	..
Hard gray coal	..	..	0	2	..	..	..	..	..	..	..	..
Hard gray coal (mother-coal streaks)	1	4¼	..	..	..	..	..	..	..	..	..	..
Soft mottled coal (mother-coal streaks)	1	11½	..	..	..	..	..	..	..	..	..	..
Coal, mottled	..	..	0	4	1	1	..	..	..	..	..	..
Hard coal	..	..	0	1½	0	2	..	..	..	..	..	..
Hard coal (mother-coal streaks)	..	..	2	1½	2	½	..	..	..	..	..	..
Coal	..	..	..	..	..	..	3	3½	0	8½	3	8
Mother-coal streak	..	..	..	..	..	..	..	..	0	½	..	..
Coal	..	..	..	..	..	..	..	..	2	10	..	..
Floor, hard gray shaly underclay.												
Thickness of bed	5	3½	5	2½	5	2	5	5	5	7½	5	9½
Thickness of coal sampled	5	1¾	5	2	4	11	5	1½	5	4½	5	7

[a] Not included in sample.

Section A (sample 8688) was cut from face of south air course 2, off cross entry 1, off main entry, about 2,900 feet east of slope.

Section B (sample 8694) was cut from face of cross entry 1, about 4,600 feet northeast of slope.

Section C (sample 8695) was cut from face of main air course, about 5,200 feet northeast of slope.

Section D (sample 8647) was cut from room 12, off north entry 3, off switchback entry, about 5,300 feet southeast of slope.

Section E (sample 8648) was cut from face of north entry 4, off switchback entry, about 4,600 feet southeast of slope.

Section F (sample 8649) was cut from room 31, off north entry 3, off switchback entry, about 4,700 feet southeast of slope.

A composite sample was made by mixing samples 8648, 8688, 8694, and 8695 for an ultimate analysis, the results of which are shown under laboratory No. 8723.

Notes.—The coal was undercut in the bottom part of bed by chain machines, punching machines, and by hand, and was shot down with a permissible explosive. The tipple had bar screens with 1½-inch and ½-inch openings. This is a coking coal, but ovens were not completed. The coal was picked on the car by five trimmers. The daily output averaged about 1,000 tons, and 1,100 tons was a maximum day's run. The future output was to be derived almost entirely by advance work.

For chemical analyses of this coal see part I of this bulletin, p. 271.

WORTH. INDIAN RIDGE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8360, 8361, 8362, 8525, 8592 (p. 272).

Mine.—Indian Ridge; Norfolk & Western district; a drift mine ½ mile northwest of Worth, on the Norfolk Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, from 3 feet 11 inches to 4 feet 11 inches, with some rolls; main roof, black shale with smooth surface; floor, dark sandy underclay.

The bed was measured and sampled at four points by J. J. Rutledge on July 22, 1909, as described below:

Sections of coal bed in Indian Ridge mine, ½ mile northwest of Worth.

Section	A		B		C		D	
Laboratory No.	8360		8361		8525		8362	
Roof, black shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	1	1	2	1	1½	1	1
Bony and sulphurous coal [a]	0	1	0	4	0	2	0	4
Coal	2	8¾	1	¾	1	10	1	11
Black sulphurous coal [a]	..	..	0	¼	..	¾	0	¼
Coal	..	..	1	..	..	..	..	7¼
Black sulphurous coal [a]	..	..	0	½	..	..	0	¼
Coal	..	..	1	2	1	3¾	..	11½
Floor, dark sandy shale.								
Thickness of bed	3	10¾	4	9½	4	6	4	11¼
Thickness of coal sampled	3	9¾	4	4¾	4	3¼	4	6¾

[a] Not included in sample.

Section A (sample 8360) was cut from pillar 106, off cross entry 3.

Section B (sample 8361) was cut from mouth (right rib) of the butt entry 3, off Salem air course.

Section C (sample 8525) was cut from the face of the north heading 4.

Section D (sample 8362) was cut from the last butt entry of the Roanoke heading.

A composite sample was made by mixing samples 8360, 8361, 8525, and 8362 for an ultimate analysis, the results of which are shown under laboratory number 8592.

Notes.—The coal at this mine was undercut with machines and with hand picks in the bottom part of bed and was generally shot down with black powder, or a permissible explosive. The tipple was equipped with bar screens with ½-inch and 1½-inch openings. This is a coking coal, and 100 tons was coked per day. The coal was picked on car by two trimmers. The daily output in July, 1909, averaged

850 tons; 1,600 tons was a maximum day's run. The output was curtailed considerably by the rigid inspection of the selling agent's inspectors. The future tonnage was to be derived mainly from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 272.

ZENITH. ZENITH MINES NOS. 1 AND 2.

Sample.—Semibituminous coal; Pocahontas field; (West Virginia No. 11) analyses Nos. 1234, 1235 (p. 272).

Mines.—Zenith Nos. 1 and 2, in the Norfolk & Western district, at Zenith, 4 miles northeast of McDowell, on the Norfolk & Western Railroad.

Coal bed.—Pocahontas No. 3. Carboniferous age, Pocahontas formation. The bed lies nearly horizontal and is opened by drifts from the outcrop. In mining, the undercut was made just below the bone, and the coal shot from the roof.

The bed was measured and sampled at two points by J. S. Burrows on October 11, 1904, as shown below:

Sections of coal in Zenith Nos. 1 and 2 mines, at Zenith.

Section	A		B	
Laboratory No.	1234		1235	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	3¼	..	..
Clay "muck" (4¼ inches).				
Bone [a]	0	1¾	..	..
Coal	2	11¾	1	½
Bone [a]	..	..	0	3¼
Coal	..	..	3	4
Thickness of bed	4	4¾	4	7¾
Thickness of coal sampled	4	3	4	4½

[a] Not included in sample.

Section A (sample 1234) was measured in No. 1 mine.

Section B (sample 1235) was measured in No. 2 mine.

Notes.—The capacity of the mines in 1904 was about 300 tons per day. Total output of both mines in fiscal year 1910, 76,906 long tons.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 905; Bull. 261, p. 83; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 278; Bureau of Mines Bull. 13, pp. 217, 276; coking tests: U. S. Geol. Survey Bull. 261, p. 129; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1365.

For chemical analyses see part I of this bulletin, p. 272; also U. S. Geol. Survey Prof. Paper 48, p. 259; Bull. 261, p. 58; Bull. 332, p. 278.

MARION COUNTY.

KINGMONT. KINGMONT MINE.

Sample.—Bituminous coal; Fairmont field; (West Virginia No. 1) analyses Nos. 1088, 1089 (p. 272).

Mine.—Kingmont; Monongahela district; a drift mine in the Fairmont district, on the west bank of the Tygart River at Kingmont, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. At Kingmont the bed lies nearly flat, and is reached by drift from below the outcrop. The thickness averages a little over 7 feet. The bed carries well-defined thin partings of shale. The principal impurity is pyrite in blades.

Two sections were measured and sampled by J. S. Burrows in 1904, as shown on the following page.

Sections of coal bed in Kingmont mine at Kingmont.

Section	A		B	
Laboratory No.	1088		1089	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	11½	2	4
Shale [a]	0	⅜	0	¼
Coal	0	3½	0	3
Shale [a]	Trace.		0	¼
Coal	0	3	0	3½
Shale [a]	0	¾	0	¾
Coal	4	8	4	3
Thickness of bed	7	3⅛	7	2¾
Thickness of coal sampled	7	2	7	1½

[a] Not included in sample.

Section A (sample 1088) was measured in room 20 on the second right entry.

Section B (sample 1089) was measured in room 14 on the fourth left entry.

Notes.—The coal from this mine has the general characteristics of the Pittsburgh coal in the Fairmont district. When sampled in 1904 the mine was shipping lump, nut, and slack sizes. The last was used at the mine for making coke. The coal was also sold for steam production, gas making. domestic use, and foreign export. The rated capacity of the mine in 1904 was 1,500 tons per day. The larger part of the product was shipped to Philadelphia as a distributing center, though a considerable part went to western cities.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 817; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1226; Bull. 261, p. 109; Bureau of Mines Bull. 13, pp. 215, 276; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1353; Bull 261, p. 126; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1374.

For chemical analyses see part I of this bulletin, p. 272; also U. S. Geol. Survey Prof. Paper 48, p. 248; Bull. 261, p. 53.

MONONGAH. MONONGAH NO. 6 MINE.

Sample.—Bituminous coal; Fairmont field; (West Virginia No. 16) analyses Nos. 2041, 2042 (p. 273).

Mine.—Monongah No. 6; Monongahela district; a drift mine at Monongah, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh bed of Pennsylvania and West Virginia. Carboniferous age, Monongahela formation. At this mine it lies nearly flat and is from 6 to 8 feet thick. The roof is of sandy shale or slate, but in mining from 8 to 12 inches of coal was left for a roof. The floor is a fire clay, soft in places.

The bed was measured and sampled at two points in the mine by W. J. von Borries and J. S. Burrows on August 22, 1905, as shown below:

Sections of coal bed in Monongah No. 6 mine at Monongah.

Section	A		B	
Laboratory No.	2041		2042	
Roof: section A, coal; section B, slate.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	1	6	..	..
Coal	0	6	2	9½
Bony coal	0	¼	[a] 0	¾
Coal	0	3½	0	2½
Bony coal	[a] 0	1¼	[a] 0	¾
Coal	0	2½	0	2¼
Bony coal	[a] 0	¾	[a] 0	1
Coal	0	3½	4	3¼
Bony coal	[a] 0	1	..	..
Coal	4	6¼	..	..
Floor, fire clay.				
Thickness of bed	7	7	7	8
Thickness of coal sampled	7	4	7	5½

[a] Not included in sample.

Section A (sample 2041) was measured in room 2 on right butt entry 3, off face entry "F", 5,000 feet southwest of the mine opening.

Section B (sample 2042) was measured in room 1, off left butt entry 3, off face entry "E," 5,000 feet northwest of the mine opening.

Notes.—In 1905 the coal from this mine was largely sold for steam production. Part was sold for domestic use and part was made into coke, the company having 200 beehive ovens near the mine.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 279; Bureau of Mines Bull. 23, pp. 69, 186; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 209; Bureau of Mines Bull. 13, pp. 221. 276; washing tests: U. S. Geol. Survey Bull. 290, p. 209; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 210; Bull. 336, pp. 25, 26, 34, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses see part I of this bulletin, p. 273; also U. S. Geol. Survey Bull. 290, p. 208; Bull. 332, p. 279.

MONONGAH. MONONGAH NO. 8 MINE.

Sample.—Bituminous coal; Fairmont field; (Ann Arbor No. 14) analyses Nos. 7586, 7588, 7418, 7419 (p. 273).

Mine.—Monongah No. 8; Monongahela district; a drift mine about 1 mile north of Monongah, on the Baltimore & Ohio Railroad.

Coal bed.—Pittsburgh. Carboniferous age, Monongahela formation. The roof is shale with 10 inches of top coal, and the floor is shale and fire clay.

The bed was measured and sampled at four points by P. M. Riefkin (samples 7586 and 7588) in April, 1909, and by G. S. Pope (samples 7418 and 7419) in January, 1909, as described below:

Sections of coal bed in Monongah No. 8 mine, 1 mile north of Monongah.

Laboratory No	7586		7588		7418		7419	
Roof, shale, top coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4¼	2	2¼	1	3	1	7½
Mother coal	0	$\frac{1}{16}$	0	..	..	..	0	¼
Bone[a]	..	..	..	1	..	..	..	..
Coal	0	7⅛	0	2⅜	0	6¼	0	3
Bone[a]	0	⅝	0	½	0	⅞	0	¾
Coal	0	$4\frac{3}{16}$	0	3¾	0	2½	0	2¾
Bone[a]	0	¾	0	1¼	0	⅜	0	½
Coal	1	$\frac{7}{16}$	2	8¼	0	1¼	0	3
Bone[a]	0	1	..	..	0	½	0	1
Sulphur	..	..	0	⅜	..	..	..	..
Coal	3	5½	1	5	0	2¼	1	8¾
Sulphur[a]	0	⅜	..	..	..	..	..	..
Coal	0	9	..	..	..	..	..	..
Bone[a]	..	..	..	..	0	1	..	..
Coal	..	..	..	..	2	9¾	1	9
Mother coal	..	..	..	..	0	⅜	0	¼
Coal	..	..	..	..	0	10⅜	0	10
Sulphur[a]	..	..	..	..	0	¼	..	..
Coal	..	..	..	..	0	9	..	..
Floor, shale.								
Thickness of bed	7	$9\frac{5}{16}$	7	⅝	6	11½	6	10¾
Thickness of coal sampled	7	$6\frac{9}{16}$	6	10	5	8½	6	8½

[a] Not included in sample.

Sample 7586 was taken 1½ miles north of opening in face of north heading 3.

Sample 7588 was taken 1¼ miles south of opening in face of right entry 3, off south entry 2.

Sample 7418 was taken 3,900 feet north-northwest of opening, from face of north entry 3.

Sample 7419 was taken 3,400 feet northwest of opening from air course 3, off south heading 2.

Notes.—The coal was machine mined. Several market sizes of coal were produced by screening. Eighty per cent of the coal was sold in run-of-mine form. Ninety-nine coke ovens operated near the mine. The daily output of the mine was 1,200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 273.

MERCER COUNTY.

COALDALE. COALDALE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8387, 8388, 8389, 8390, 8391, 8468 (p. 273).

Mine.—Coaldale; Norfolk & Western district; a drift mine at Coaldale, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 8 to 11 feet and dipping gently to the northwest; roof, clay shale underlain with 3 to 15 inches of draw slate and with a cap rock 15 to 20 feet above; floor, rather soft underclay with smooth surface.

The bed was measured and sampled at five points by C. A. Fisher on July 23, 1909, as described below:

Sections of coal bed in Coaldale mine at Coaldale.

Section	A		B		C		D		E	
Laboratory No	8387		8388		8389		8391		8390	
Roof, clay shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	6	1	0	1	2	..	..	1	5
Bone, sulphur	[a]0	½	[a]0	½	[a]0	½	..	..	[a]0	½
Coal	2	6	2	6	2	3	1	10	2	1
Gray coal	1	6	1	7	1	5	1	0	1	9
Coal	2	4	2	7	3	0	3	6	2	8½
Bone	0	1½	[a]0	½	[a]0	½	[a]0	½	0	2
Coal	2	0	0	10	1	5	1	10½	2	1
Sulphur bone	[a]0	½	[a]0	½	..	..	..	..	[a]0	½
Coal	0	10	0	4½	..	..	..	..	0	5½
Floor, rather soft clay.										
Thickness of bed	10	10½	9	0	9	4	8	3	10	9
Thickness of coal sampled	10	9½	8	10½	9	3	8	2½	10	8

[a] Not included in sample.

Section A (sample 8387) was cut from a pillar in room 8 on entry 5.

Section B (sample 8388) was cut from a pillar in room 16 on left entry 9.

Section C (sample 8389) was cut from a pillar in room 10 on left entry 12.

Section D (sample 8391) was cut from a pillar in room 1 on right entry 13.

Section E (sample 8390) was cut from a pillar in room 17, on right entry 5½.

A composite sample was made by mixing the pillar samples 8387, 8388, 8389, 8390, and 8391 for an ultimate analysis, the results of which are shown under laboratory No. 8468.

Notes.—The coal at this mine was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple was equipped with bar screens with 4-inch 1½-inch, and ¾-inch spaces. The fine screenings, to the extent of 75 tons per day, were removed from the run-of-mine coal and coked in beehive ovens. The coal was picked on car. The daily output averaged 800 tons, which was derived entirely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 273.

COOPERS. EAST MILL CREEK AND WEST MILL CREEK MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8392, 8393, 8394, 8395, 8396, 8397, 8476 (p. 274).

Mines.—East Mill Creek and West Mill Creek; Norfolk & Western district; drift mines 1 mile northwest of Coopers, on the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, as mined, from 7 to 14 feet; roof, clay shale, underlain with 6 to 10 inches of "draw slate," which tended to fall with the coal, and capped 15 feet to 20 feet above with sandstone; it was customary to leave 1 foot of top coal as the immediate roof in advance work; floor, rather soft clay shale, with smooth surface.

The bed was measured and sampled at six points by C. A. Fisher on July 21 and 22, 1909, as described below:

Sections of coal bed in East Mill Creek mine, 1 mile northwest of Coopers.

Section	A		B	
Laboratory No.	8397		8396	
Roof, clay shale.	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	1	2	[a] 1	2
Sulphur bone	[a] 0	¾	[a] 0	½
Coal	2	4	2	4½
Sulphur bone	..	..	[a] 0	1½
Gray coal	1	5	0	10½
Bone	..	..	[a] 0	1¼
Coal	..	..	0	9
Sulphur bone	..	..	[a] 0	½
Coal	4	0	3	4
Floor, soft clay shale.				
Thickness of bed	8	11¾	8	9¾
Thickness of coal sampled	8	11	7	4

[a] Not included in sample.

Section A (sample 8397) was cut from a pillar of room 4 on cross entry 2.

Section B (sample 8396) was cut from the face of the Taber entry, 800 feet north of the Brickey Taylor entry.

Sections of coal bed in West Mill Creek mine, 1 mile northwest of Coopers.

Section	A		B		C		D	
Laboratory No.	8394		8395		8392		8393	
Roof, clay shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	[a] 1	0	1	2	1	2	0	10
Bone and sulphur	[a] 0	¾	[a] 0	½	[a] 0	½	[a] 0	¾
Coal	2	10	2	9	2	2	2	7½
Gray graphitic coal	1	2	0	9	1	4	1	3
Coal	3	10	2	8	3	0	3	7¾
Bone and sulphur	[a] 0	½	[a] 0	½	[a] 0	½	[a] 0	½
Coal	1	4	1	4	1	5	0	7
Floor, clay shale.								
Thickness of bed	10	3¼	8	9	9	2	9	½
Thickness of coal sampled	9	2	8	8	9	1	8	11¼

[a] Not included in sample.

Section A (sample 8394) was cut from a pillar in room 16 on the Gammons entry.

Section B (sample 8395) was cut from a pillar in room 17 on the Keystone entry.

Section C (sample 8392) was cut from the face of the tunnel entry, or the heading for entry 7.

Section D (sample 8393) was cut from the pillar in room 9 on the Jackson entry in what is known as the West Fork Mill Creek drift.

A composite sample was made by mixing both the face and the pillar samples 8392, 8394, and 8395 for an ultimate analysis, the results of which are shown under laboratory No. 8476.

Notes.—The coal at these mines was undercut by hand in bottom part of bed, and was shot down with black powder. The tipple, which was used jointly by the three mines, was equipped with bar screens with ¾-inch, 1½-inch, and 4-inch spaces.

Approximately 25 per cent of the output was shipped as run-of-mine coal; the remainder was what passed over the screens, the screenings being coked in beehive ovens. The coal was picked on car. The daily output averaged 250 tons, and 400 tons was the maximum day's run. The future output was to be derived from both advance work and pillars in the proportion of 1 to 2.

For chemical analyses of this coal, see part I of this bulletin, p. 274.

GOODWILL. GOODWILL MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8712, 8713, 8718, 8834 (p. 274).

Mine.—Goodwill; Norfolk & Western district; a drift mine, one-half mile north of Goodwill, on the Flipping Creek Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The coal at the mine averages 4 feet 9 inches in thickness; has a hard gray shale roof, overlain with a cap rock of sandstone. There is a rash or draw slate 3 to 5 inches thick which comes down with the coal. The floor is a soft underclay. The cover over the coal is from 30 to 300 feet thick.

The bed was measured and sampled at three points by J. W. Groves on August 4, 1909, as described below:

Sections of coal bed in Goodwill mine, ½ mile north of Goodwill.

Section	A		B		C	
Laboratory No	8718		8712		8713	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, hard shale (in part) and draw slate.						
Coal	1	1	1	1	1	3½
Sulphur[a]	0	½	0	½	0	1½
Coal	2	0	..	..	0	1½
Gray coal	..	..	0	2	0	2½
Mother coal	0	¾	..	..	..	..
Coal	0	10	3	2½	2	7
Mother coal	0	½	..	..	0	¾
Coal	0	2½	..	..	0	1½
Floor, soft underclay.						
Thickness of bed	4	3¼	4	6	4	6¼
Thickness of coal sampled	4	2¾	4	5½	4	4¾

[a] Not included in sample.

Section A (sample 8718) was cut from the face of cross entry 3, off Jewell's haulway, 2,200 feet north of the drift mouth.

Section B (sample 8712) was cut from the face of Smith's entry, 2,900 feet northeast of the drift mouth.

Section C (sample 8713) was cut from the pillar in room 1, off middle drift, 2,500 feet N. 80° E. of the drift mouth.

A composite sample was made by mixing the face samples 8712 and 8718 for an ultimate analysis, the results of which are shown under laboratory No. 8834 (p. 274).

Notes.—The coal at this mine was undercut with puncher machines and hand picks, and was shot down with black powder. In August, 1909, the coal was being loaded in run-of-mine form. The tipple had bar screens with 1-inch openings for taking out slack to supply the coke ovens. These ovens were not in operation, and the coal consequently was not being screened at the time of sampling. It was picked by two trimmers as it was loaded on the cars. The capacity of the mine was 600 tons with an output at that time of 300 tons daily. The future output of this mine was for some time to be derived from advance work. Output of mine should be considered in connection with that of Louisville Nos. 2 and 3 mines.

For chemical analyses of this coal see part I of this bulletin, p. 274.

GOODWILL. LOUISVILLE NO. 2 AND NO. 3 MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8714, 8715, 8716, 8717, 8719, 8720, 8721, 8790, 8791 (p. 275).

Mines.—Louisville Nos. 2 and 3; Norfolk & Western district; drift mines, ½ mile and 1 mile, respectively, northwest of Goodwill on the Flipping Creek Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. It varies in thickness from 4 to 5½ feet, having one sulphur and one gray band parting. In a part of the mine there is a "draw slate" that came down with the coal. The roof is a hard gray shale. The floor is a hard underclay with a smooth surface. The cover over the coal is from 30 to 500 feet thick.

The bed was measured and sampled at five points in No. 2 mine and at two points in No. 3 mine on July 31, 1909, and August 3, 1909, by J. W. Groves, as described below:

Sections of coal bed in Louisville No. 2 mine, ½ mile from Goodwill.

Section	A		B		C		D		E	
Laboratory No	8717		8721		8715		8719		8720	
Roof, hard shale, or draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	3	1	1½	1	1½	1	3	1	2¼
Pyrites	..	..	..	..	..	..	..	..	[a] 0	¾
Bony coal	[a] 0	2½	..	..	..	..	..	..	[a] 0	2
Sulphur and shale	..	..	[a] 0	½	..	..	..	..	..	..
Sulphur and bony coal	..	..	..	..	[a] 0	1½	[a] 0	2¼	..	..
Gray band	..	..	..	..	0	2	..	..	..	..
Coal	1	11¾	2	1	3	0	3	5	3	½
Mother coal	0	½	0	½	..	..	..	..	..	..
Coal	1	1½	1	1	..	..	..	..	..	..
Floor, hard underclay.										
Thickness of bed	4	7¼	4	4½	4	5	4	10¼	4	5½
Thickness of coal sampled	4	4¾	4	4	4	3½	4	8	4	2¾

[a] Not included in sample.

Section A (sample 8717) was cut from the face of room 11, off left entry 6, 4,300 feet northeast of the drift mouth.

Section B (sample 8721) was cut from a pillar in room 22, off left entry 4, 3,350 feet northeast of the drift mouth.

Section C (sample 8715) was cut from the face of left air course 7, 4,500 feet northeast of drift mouth.

Section D (sample 8719) was cut from the face of 3½ left entry cut off, 2,750 feet north of drift mouth.

Section E (sample 8720) was cut from a pillar of room 3, on right entry 5, 3,300 feet northeast of the drift mouth.

Composite samples were made by mixing the face samples 8715, 8717, and 8719, and by mixing the pillar samples 8720 and 8721 for ultimate analyses, the results of which are given under laboratory numbers 8791 and 8790, respectively.

Sections of coal bed in Louisville No. 3 mine, 1 mile northwest of Goodwill.

Section	A		B	
Laboratory No	8714		8716	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	4½	1	2
Pyrites [a]	0	2½	..	..
Sulphur and bony coal [a]	..	..	0	2¼
Coal	0	8	0	3¼
Mother coal	0	¾	0	½
Coal	2	11	3	4
Shale [a]	0	1	..	..
Coal	0	1½	..	..
Floor, hard underclay.				
Thickness of bed	5	5¼	5	0
Thickness of coal sampled	5	1¾	4	9¾

[a] Not included in sample.

Section A (sample 8714) was cut from the face of right entry 4, 1,700 feet northwest of the drift mouth.

Section B (sample 8716) was cut from the pillar of left entry 3, 1,400 feet northwest of the drift mouth.

Notes.—The coal at these mines was undercut with hand picks and shot down with black powder. The tipple was provided with bar screens having 4-inch, 1¼-inch, and 1-inch openings, making possible the loading of five sizes of coal, viz, lump, egg, nut, slack, and run-of-mine. About 150 tons of slack was used per day in the coke ovens. The capacity of the two mines was about 1,100 tons, the output being then about 750 tons. The output of the two mines is given together for the reason that the haulage outside the mine, the tipple and loading arrangements were used in common and the coal was mixed at it was loaded. The future supply of coal was to be from advance work and pillars in about equal proportions. Output of mines should be considered in connection with that of Goodwill mine.

For chemical analyses of this coal see part I of this bulletin, p. 275.

HIAWATHA. HIAWATHA MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8374, 8375, 8376, 8377, 8461 (p. 275).

Mine.—Hiawatha; Norfolk & Western district; a drift mine at Hiawatha, on the Widemouth Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, ranging as mined from 4 feet 9 inches to 5 feet 4 inches; roof, medium hard shale underlain with from 3 to 6 inches of soft draw slate which fell with the coal and therefore was liable to become mixed with it; floor, hard shale with smooth surface.

The bed was measured and sampled at four points by J. W. Groves on July 23, 1909, as described below:

Section of coal bed in Hiawatha mine at Hiawatha.

Section	A		B		C		D	
Laboratory No	8374		8375		8376		8377	
Roof, medium hard shale and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Cube coal	[a]0	1	[a]0	1	[a]0	1	[a]0	1
Coal	0	11½	1	½	1	1½	1	2
Sandy shale	[a]0	6	[a]0	6	[a]0	5½	0	1¼
Coal	0	5½	0	6½	0	2	0	6½
Gray coal	0	2½	0	2½	0	1½	[a]0	2½
Coal	1	1	1	8	3	2½	2	8
Mother coal	0	½	..	..	..	..	..	..
Coal	0	6½	..	..	..	..	..	..
Mother coal	0	1	0	¼	..	..	..	..
Coal	1	1	1	0	..	..	..	..
Floor, hard shale.								
Thickness of bed	5	½	5	¾	5	2	4	9¼
Thickness of coal sampled	4	5½	4	5¾	4	7½	4	5¾

[a] Not included in sample.

Section A (sample 8374) was cut from the face of the left air course 1, 1,300 feet north of drift mouth.

Section B (sample 8375) was cut from the face of room 3 on left entry 2, 1,400 feet northeast of drift mouth.

Section C (sample 8376) was cut from the face of the main entry, 2,400 feet northeast of drift mouth.

Section D (sample 8377) was cut from a pillar in room 12 on right entry 2, 1,800 feet east of drift mouth.

A composite sample was made by mixing both face and pillar samples 8374, 8375, 8376. and 8377 for an ultimate analysis, the results of which are shown under laboratory No 8461.

Notes.—The coal at this mine was undercut by hand in bottom part of bed and was shot down with black powder. The tipple was equipped with screens of both the revolving and bar types, with ½-inch, ¾-inch, 1-inch, 1½-inch, and 2½-inch spaces. The screenings that passed through the 2½-inch spaces formed 60 per cent of the entire output and were then sized and washed after screening. This is a coking coal, but there were no ovens at this plant. The coal was picked on car by five trimmers. The daily output averaged 400 tons, and 600 tons was the maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 275.

MORA. EXPERIMENTAL DRIFT.

Sample.—Semibituminous coal; Pocahontas field; (West Virginia No. 10) analyses Nos. 1240, 1244 (p. 275).

Mine.—Experimental drift; Norfolk & Western district; at Mora (McComas), on the Norfolk & Western Railroad.

Coal bed.—The bed opened was designated by the owner the No. 6 coal. It lies above the Pocahontas bed and is part of the Clark formation, of Carboniferous age.

The bed was measured and sampled by J. S. Burrows on October 10, 1904, as shown below:

Sections of coal bed in experimental mine at Mora.

Section	A		B	
Laboratory No	1244		1240	
	Ft.	*in.*	*Ft.*	*in.*
Coal	0	2	0	2
Bone and sulphur [a]	0	2	0	2
Coal	2	11½	3	9
Thickness of bed	3	3½	4	1
Thickness of coal sampled	3	1½	3	11

[a] Not included in sample.

Section A (sample 1244) was measured at a point midway between the entrance and the face of the drift.

Section B (sample 1240) was measured at the face of the drift.

Notes.—The coal of this bed had not been worked commercially in 1904, and the drift was opened to determine the quality of the coal.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 897; Bull. 261, p. 83; Bureau of Mines Bull. 23, p. 69; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1364; Bull. 261, p. 128; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1386.

For chemical analyses see part I of this bulletin, p. 275; also U. S. Geol. Survey Prof. Paper 48, p. 258; Bull. 261, p. 57.

MORA. CRANE CREEK NO. 1 AND NO. 2 MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 10413, 10414, 10415, 10416, 10417, 10436 (p. 276).

Mines.—Crane Creek No. 1 and No. 2 mines; Norfolk & Western district; slope mines ½ mile west of Mora, on the Pocahontas division of the Norfolk & Western Railroad.

Coal bed.—Known as Pocahontas No. 3. Carboniferous age, the Pocahontas formation. The coal in these mines varies in thickness from 4 to 6 feet 6 inches. The roofs and floors of the bed are of good quality. A "rash" varying from 1 to 4 inches in thickness overlies the coal; this was removed from all run-of-mine coal at the tipple.

The bed was measured and sampled on May 2, 1910, by P. M. Riefkin and A. A. Straub, as shown on the following page.

Sections of coal bed in Crane Creek Nos. 1 and 2 mines, ½ mile west of Mora.

Section	A		B		C		D		E	
Laboratory No.	10413		10414		10416		10415		10417	
Roof, sandstone and soft rash.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8¾	0	9⅝	0	5⅞	0	10⅞	0	9⅝
Mother coal	0	¼	..	..	Streak.		..	..	..	..
Bone and sulphur	..	..	[a] 0	3½	..	..	..	..	..	..
Bony coal	..	..	..	..	..	..	[a] 0	2¾	[a] 0	2⅜
Coal	0	2⅞	0	2	0	4¾	0	6⅛	2	4⅝
Bone and slate	[a] 0	2¼	..	..	..	..	..	..	..	..
Mother coal	..	..	Streak.		..	..	Streak.		Streak.	
Bony coal	..	..	..	..	[a] 0	1	..	..	..	..
Coal	0	11½	1	5½	0	5¼	1	7½	1	1⅜
Mother coal	0	⅛	0	¼	0	⅜	..	..	..	..
Shale	..	..	..	..	..	..	[a] 0	⅜	..	..
Coal	0	1¼	1	9¼	0	3½	0	10⅛	..	..
Mother coal	0	⅜	..	..	0	½	Streak.		..	..
Coal	1	1	..	..	2	2	0	7⅜	..	..
Mother coal	[a] 0	¼	..	..	0	⅜	..	..	..	..
Coal	1	0	..	..	0	3	..	..	..	..
Floor, shale.										
Thickness of bed	4	4⅝	4	6⅛	4	2⅝	4	9⅛	4	6
Thickness of coal sampled	4	2⅛	4	2⅝	4	1⅝	4	6	4	3⅝

[a] Not included in sample.

Section A (sample 10413) was cut from the face of cross entry 14, 3,200 feet northwest of drift mouth of the No. 1 mine.

Section B (sample 10414) was cut from the face of main heading 1, 4,300 feet north of drift mouth.

Section C (sample 10416) was cut from the chain pillar at room 10 between No. 1 and No. 2 cross entries of main heading, 1,400 feet northeast of drift mouth of the No. 2 mine.

Section D (sample 10415) was cut from the face of Ozark heading, 4,400 feet northeast of drift mouth.

Section E (sample 10417) was cut from the face of pen entry, 4,800 feet north of drift mouth.

A composite sample was made by mixing samples 10413, 10414, 10415, 10416, and 10417 for an ultimate analysis, the results of which are shown under laboratory No. 10436.

Notes.—Crane Creek Nos. 1 and 2 mines were supplying the same tipple. The coal in these mines was undercut with hand with picks in the bottom part of the bed and shot down with black powder. The tipple was equipped with a 4-inch bar screen. 2-inch, 1½-inch, 1-inch, and ⅝-inch revolving screens, a washer, and a picking table. All coal passing over the 4-inch screen was shipped as run of mine and passed over a picking table before going into the railroad cars. The commercial sizes shipped besides run of mine were egg coal and stoker coal. All the coal which passed through the ⅝-inch mesh of the revolving screen was washed. Little of the washed coal was shipped, most of it being coked. The average output of the two mines was 1,000 tons per day with a capacity of 1,750 tons daily. The unmined area was about 3,800 acres.

For chemical analyses of this coal see part I of this bulletin, p. 276.

MORA. PINNACLE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 10418, 10419, 10420, 10421, 10422, 10437 (pp. 276, 277).

Mine.—Pinnacle; 1 mile north of Mora; Norfolk & Western district; a slope mine on the Pocahontas Division of the Norfolk & Western Railway.

Coal bed.—Known as Pocahontas No. 3. Carboniferous age, Pocahontas formation. The coal in this mine is 4 feet to 5 feet 6 inches thick. The roof and floor are good; a "rash" varying from 1 to 4 inches occurs above the coal, but is eliminated from the run-of-mine coal at the tipple by 4-inch bar screens.

The bed was measured and sampled on May 3, 1910, by P. M. Riefkin, as shown below:

Sections of coal bed in Pinnacle mine, 1 mile north of Mora.

Section	A		B		C		D		E	
Laboratory No	10418		10419		10420		10421		10422	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, sandstone and rash.										
Coal	0	11½	1	1	1	1	0	10	0	10
Bone and sulphur [a]	0	5½	0	4½	0	5	..	..	..	..
Mother coal	..	..	..	..	..	..	0	⅛	0	¼
Coal	1	5	1	0	1	1	0	2	0	1
Mother coal	Streak.		0	⅛	..	..	..	..	..	..
Mother coal and bone	..	..	..	..	0	⅛	..	..	..	..
Sulphur and bone [a]	..	..	..	..	..	..	0	5½	0	5½
Coal	0	11	1	3	1	5	1	9½	1	10
Mother coal and bone [a]	0	½	..	..	..	..	..	..	..	..
Mother coal	..	..	Streak.		0	½	0	⅛	Streak.	
Coal	0	5	1	0	0	5½	0	10	1	2¾
Floor, shale.										
Thickness of bed	4	2½	4	8⅝	4	6⅛	4	1¼	4	5½
Thickness of coal sampled	3	8½	4	4⅛	4	1⅛	3	7¾	4	0

[a] Not included in sample.

Section A (sample 10418) was cut from the face of cross entry 1, 3,300 feet east of drift mouth.

Section B (sample 10419) was cut from the pillar on right entry 4, off entry 13, 1,500 feet northeast of drift mouth.

Section C (sample 10420) was cut from the face of Thomas heading, 3,600 feet north of drift mouth.

Section D (sample 10421) was cut from the face of Cobbler heading, off main heading 2, 2,900 feet east of drift mouth.

Section E (sample 10422) was cut from pillar 2 on cross left entry 8, off main heading 1, 2,400 feet southeast of drift mouth.

A composite sample was made by mixing samples 10418, 10419, 10420, 10421, and 10422 for an ultimate analysis, the results of which are shown under laboratory No. 10437 (p. 277).

Notes.—The coal in this mine was undercut in bottom part of bed by hand with picks, and was shot down with black powder. The tipple was equipped with a 4-inch bar screen and with 2-inch, 1½-inch, 1-inch, and ⅝-inch revolving screens, a Jeffrey washer, and a picking table. The coal was picked on a picking table and on the cars after passing over the 4-inch bar screen. The coal which passed through the 4-inch screen fell into a revolving screen of 2-inch, 1½-inch, 1-inch, and ⅝-inch meshes, and the screened coal was shipped in egg and stoker form. All the coal which passed through the ⅝-inch mesh revolving screen was washed. Little of the washed coal was shipped, practically all of it being coked. The average output of this mine was about 1,000 tons daily, with a capacity of 1,600 tons per day. The unmined area was about 1,700 acres.

For chemical analyses of this coal see part I of this bulletin, pp. 276, 277.

SIMMONS. BUCKEYE MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8564, 8565, 8566, 8567, 8568, 8569, 8570, 8675 (p. 277).

Mine.—Buckeye; Norfolk & Western district; a drift mine 1½ miles northwest of Simmons, on the Simmons Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The bed at this mine has an average thickness of 5 feet 10 inches with a good hard shale roof and a hard underclay floor. The floor has a smooth surface, so that very little of it got mixed with the coal. The cover over the coal varies from 30 to 300 feet.

The bed was measured and sampled at seven points by J. W. Groves on July 30, 1909, as described below:

Sections of coal bed in Buckeye mine, 1½ miles northwest of Simmons.

Section	A		B		C		D		E		F		G	
Laboratory No	8564		8565		8566		8570		8567		8568		8569	
Roof, hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	5½	1	2½	1	0	2	3	2	1	2	3½	1	7¼
Mother coal	..	..	0	½	0	¼	..	..	0	¼	..	..	..	..
Coal	..	..	1	1	1	3½	..	..	0	4	..	..	..	..
Pyrites and bony coal [a]	0	1¼	0	2	0	2½	..	..	..	..	0	½	..	..
Pyrites and shale[a]	..	..	..	..	..	..	0	3½	..	..	..	..	..	..
Coal	0	3½	0	3	0	2	2	5	..	..	0	1½	..	..
Bony coal and sulphur [a]	..	..	..	..	..	..	..	..	..	..	0	¼	..	..
Bony coal [a]	0	3	0	3	0	2½	..	..	0	4½	..	..	0	1½
Mother coal	..	..	..	..	..	..	0	½	..	..	..	..	..	..
Coal	3	3½	2	11	3	3¼	0	11	3	2	3	3	3	3
Floor, hard underclay.														
Thickness of bed	6	4¾	5	11	6	2	5	11	5	11¾	5	8¾	4	11¾
Thickness of coal sampled	6	½	5	6	5	9	5	7½	5	7¼	5	8	4	10¼

[a] Not included in sample.

Section A (sample 8564) was cut from the face of the Simmons entry.

Section B (sample 8565) was cut from the face of cross entry 7, off the Simmons entry.

Section C (sample 8566) was cut from the face of room 10, off cross entry 5.

Section D (sample 8570) was cut from a pillar of room 11, off the Newman entry.

Section E (sample 8567) was cut from the face of room 8 on the Bennetts entry.

Section F (sample 8568) was cut from the face of the Price entry.

Section G (sample 8569) was cut from the face of room 11, off cross entry 3.

A composite sample was made by mixing the face samples 8564, 8565, 8566, 8567, 8568, and 8569 for an ultimate analysis, the results of which are shown under laboratory No. 8675 (p. 277).

Notes.—The coal at this mine was undercut with hand picks and shot down with black powder. A permissible explosive was also used to some extent. The tipple was provided with bar screens with spaces of 6 inches, 4 inches, 2 inches, and 1 inch, making possible the loading of the following six sizes of coal: Lump, egg, nut, steam coal, slack, and run-of-mine. About 150 tons of slack was used daily in making coke. There were at this mine 160 ovens, 60 of which were in operation in July, 1909. Seventy per cent of the output of the mine was sold as run-of-mine coal. The coal was picked by three trimmers as it was loaded on the cars. The capacity of the mine was 1,000 tons daily, and the actual output at that time was 400 tons.

For chemical analyses of this coal see part I of this bulletin, p. 277.

SIMMONS. BOOTH-BOWEN MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8549, 8550, 8551, 8552, 8553, 8554, 8682, 8683 (p. 277).

Mine.—Booth-Bowen; Norfolk & Western district; a drift mine 2 miles northwest of Simmons, on the Simmons Creek Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. The thickness of coal as mined ranges from 4 feet to 10 feet. It has a "gray band," which is a small band of coal higher in ash content harder than the main body of the coal. It also has a bony coal band accompanied with "sulphur." The roof in a part of the mine is shale and in the other part is sandstone. It has a smooth surface, is hard, and did not fall with the coal. The floor is a hard underclay.

The bed was measured and sampled at six points by J. W. Groves on July 26 and 27, 1909, as described below:

Sections of coal bed in Booth-Bowen mine, 2 miles northwest of Simmons.

Section	A		B		C		D		E		F	
Laboratory No.	8549		8550		8551		8552		8553		8554	
Roof, sandstone, and hard gray shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	2½	1	2½	1	2	0	11½	1	7¼	0	10½
Bony coal [a]	0	1	0	2½	0	2½	0	2½	0	1¾	0	1½
Coal	3	7½	3	5¼	2	9	1	5	1	9½	2	6½
Mother coal	..	..	..	..	0	1	0	½	0	¼	..	..
Coal	..	..	..	..	0	7½	1	0	1	0	..	..
Shale [a]	..	..	..	..	0	1½	..	..	..	..	..	..
Shale and coal (mixed) [a]	..	..	..	..	0	9¾	..	..	..	..	..	..
Bony coal [a]	..	..	..	..	..	..	0	3	0	1¼	0	2½
Coal	..	..	..	..	..	..	3	7½	3	8½	0	2½
Bony coal [a]	..	..	..	..	..	..	..	..	..	..	0	1
Coal	..	..	..	..	..	..	..	..	..	..	0	9½
Bony coal [a]	..	..	..	..	..	..	..	..	..	..	0	3
Coal	..	..	..	..	..	..	..	..	..	..	2	7¾
Floor, hard underclay.												
Thickness of bed	4	11	4	10¼	5	9¼	7	6	8	4½	7	8¾
Thickness of coal sampled	4	10	4	7¾	4	7½	7	½	8	1½	7	¾

[a] Not included in sample.

Section A (sample 8549) was cut from the face of entry 9, off Bird Hunter's entry.

Section B (sample 8550) was cut from the face of entry 6, off Bird Hunter's entry.

Section C (sample 8551) was cut from the face of No. 9 butt entry, off Kansas City entry.

Section D (sample 8552) was cut from the pillar of room 9 on Yukon entry.

Section E (sample 8553) was cut from pillar 3 on entry 35.

Section F (sample 8554) was cut from the pillar of room 21 on Meadow's entry.

Composite samples for ultimate analyses were made by mixing the face samples Nos. 8549, 8550, and 8551, the results of which are shown under laboratory No. 8683 (p. 277), and the pillar samples Nos. 8552, 8553, and 8554, the results of which are shown under laboratory No. 8682 (p. 277).

Notes.—The coal at this mine was undercut with hand picks and shot down with black powder. The tipple was provided with bar screens with spaces of 3 inches, 1½ inches, and ½ inch, so that it was possible to load five sizes of coal, which were lump, egg, nut, slack, and run-of-mine. The coal was picked on the loaded cars, five pickers being employed for this purpose. There was 150 tons of screenings used per day at the mine for making coke. The capacity of the mine was 1,100 tons per day, with an output of 1,000 tons, 83 per cent of which was sold as run-of-mine coal. The mine had a large territory of coal and 65 per cent of the output was to be from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 277.

SIMMONS. CASWELL-ELKHORN AND CASWELL-HEMLOCK MINES.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8555, 8556, 8557, 8558, 8559, 8677, 8560, 8561, 8562, 8563, 8676 (p. 278).

Mines.—Caswell-Elkhorn and Caswell-Hemlock; Norfolk & Western district; drift mines 2 miles west of Simmons (Freeman post office), on the Simmons Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pottsville formation. The thickness of the coal as mined ranges from 6½ to 8 feet; the roof is a gray shale which, in places, is soft, but in general about a foot of coal was left as a roof, thus preventing any shale from getting into the coal. The floor is an underclay with smooth surface.

The bed was measured and sampled at five points in the Caswell-Elkhorn mine on July 27 and 28, 1909, and at four points in the Caswell-Hemlock mine on July 28 and 29, 1909, by J. W. Groves, as described below:

Sections of coal in Caswell-Elkhorn mine, 2 miles west of Simmons.

Section	A		B		C		D		E	
Laboratory No.	8555		8556		8557		8558		8559	
Roof, hard shale, and coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	6½	1	10	2	1½	2	9	2	10
Gray band	..	..	0	2½	0	2	..	..	..	..
Coal	..	..	0	9½	0	5¼	..	..	..	..
Bony coal and sulphur [c]	..	..	..	..	0	1¼	..	..	..	..
Sulphur [a]	..	..	..	..	..	..	0	½	..	..
Bony coal [a]	0	2	..	..	..	..	..	..	0	3
Coal	0	10	..	..	0	3½	0	3	..	3
Hard coal (good)	0	2	..	..	..	..	..	..	0	..
Bony coal and sulphur [a]	0	2	0	1½	0	2	..	..	..	..
Shale and sulphur [a]	..	..	..	..	..	..	0	1½	..	..
Coal	2	6½	3	8	1	1	4	3	..	..
Bony coal [a]	0	1	..	..	..	..	..	..	0	2½
Mother coal	..	..	..	..	0	1	..	..	..	..
Coal	1	3	..	..	2	7	..	..	3	5½
Floor, hard underclay.										
Thickness of bed	7	7	6	7½	7	½	7	5	7	0
Thickness of coal sampled	7	4	6	6	6	9¼	7	3	6	6½

[a] Not included in sample.

Section A (sample 8555) was cut from the face of left entry 6, 3,800 feet northwest of the drift mouth.

Section B (sample 8556) was cut from the face of room 1, off right entry 4, 2,400 feet northwest of the drift mouth.

Section C (sample 8557) was cut from the face of the right entry 1, 1,400 feet north of the drift mouth.

Section D (sample 8558) was cut from the face of the border line entry off right entry 3, 2,800 feet north of the drift mouth.

Section E (sample 8559) was cut from pillar 12 on left entry 3, 2,400 feet west of the drift mouth.

A composite sample was made by mixing the face samples 8555, 8556, 8557, and 8558 for an ultimate analysis, the results of which are shown under laboratory No. 8677 (p. 278).

Sections of coal bed in Caswell-Hemlock mine, 2 miles west of Simmons.

Section	A		B		C		D	
Laboratory No.	8560		8561		8562		8563	
Roof, hard shale and coal.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	10	3	7	2	3	5	3
Bony coal [a]	0	1½	..	..	..	..	[a] 0	2
Gray band	..	..	..	..	0	2	..	..
Coal	0	9	..	..	0	7¼	3	5
Bony coal [a]	0	1½	..	..	..	..	..	..
Mother coal	..	..	0	½	0	1¼	..	..
Coal	0	5	0	7½	0	8	..	..
Bony coal [a]	0	3	0	2	0	3	..	..
Coal	3	5	3	5	3	½	..	..
Shale [a]	..	..	..	..	0	1	..	..
Coal [a]	..	..	..	..	0	1	..	..
Floor, smooth hard underclay.								
Thickness of bed	7	11	7	10	7	3	8	10
Thickness of coal sampled	7	5	7	8	6	10	8	8

[a] Not included in sample.

Section A (sample 8560) was cut from the face of the Charleston entry, 4,800 feet south of the drift mouth.

Section B (sample 8561) was cut from the pillar of room 4 on the straight entry, 5,600 feet south of the drift mouth.

Section C (sample 8562) was cut from pillar of room 18, off Deacon's entry, 7,000 feet southeast of the drift mouth.

Section D (sample 8563) was cut from the pillar of room 8 on cross entry 3, 6,700 feet south of the drift mouth.

A composite sample was made by mixing the pillar samples Nos. 8561, 8562, and 8563 for an ultimate analysis, the results of which are shown under laboratory No. 8676 (p. 278).

Notes.—The coal at these mines was undercut with air-puncher machines and with hand picks, and was shot down with black powder. The coal was hauled out to the railroad tipple, which had ¾-inch bar screens for taking out the slack to supply 120 ovens. These were not in operation in July, 1909; the coal in consequence was not screened and was sold in run-of-mine form. Twenty per cent of the coal would pass through a ¾-inch screen. The coal from the two mines was mixed in the loading chutes, the output from each being about 550 tons, making a combined output of 1,100 tons daily. The greater part of the coal from the Caswell-Elkhorn mine was taken from advance work, and that from the Caswell-Hemlock mine was taken from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 278.

SPRINGTON. SPRING MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8434, 8435, 8436, 8437, 8438, 8473 (p. 279).

Mine.—Spring; Norfolk & Western district; a drift mine ½ mile east of Springton on the Wide Mouth Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as the Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, fairly uniform, varying from 4 feet 3 inches to 4 feet 11 inches; dip slight to the west; roof, shale of good quality; floor, shale with thin layers of coal.

The bed was measured and sampled at five points by A. J. Hazlewood on July 23, 1909, as described below:

Sections of coal bed in Spring mine, ½ mile east of Springton.

Section	A		B		C		D		E	
Laboratory No	8434		8435		8436		8437		8438	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.										
Cube coal	..	..	[a]0	2	[a]0	1	..	..	..	..
Sulphur coal	..	..	0	2½	0	2½	..	..	..	..
Coal, fragile	1	3¼	1	3	1	5	1	7	1	3¾
Shale	[a]0	1	..	..	..	..	..	..	[a]0	1¼
Coal, hard	0	4¼	..	..	..	..	..	..	0	5
Bony coal	[a]0	3½	0	3	0	2½	0	4	0	3
Coal, fragile	2	9½	2	9	2	10¾	2	5¼	2	6
Floor, shale, containing thin layers of coal.										
Thickness of bed	4	9½	4	7½	4	9¾	4	4¼	4	7
Thickness of coal sampled	4	5	4	5½	4	8¾	4	4¼	4	5¾

[a] Not included in sample.

Section A (sample 8434) was cut from the face of left heading 2, 3,600 feet from the drift mouth.

Section B (sample 8435) was cut from the face of the Franklin entry (right entry 2, off left heading 2), 3,400 feet from the drift mouth.

Section C (sample 8436) was cut from the face of the main heading, 3,600 feet from the drift mouth.

Section D (sample 8437) was cut from the face of the Tazewell entry, 3,600 feet from the drift mouth.

Section E (sample 8438) was cut from the face of left heading 1, 3,600 feet from the drift mouth.

A composite sample was made by mixing samples 8434, 8435, 8436, 8437, and 8438 for an ultimate analysis, the results of which are shown under laboratory No. 8473 (p. 279).

Notes.—The coal at this mine was undercut with punching machines in bottom part of bed and was shot down with black blasting powder and dynamite. There were no screens at the mine, all of the coal being shipped in run-of-mine form. The coal was picked on the car by three trimmers. The daily output in 1909, at time of sampling, averaged 700 tons, and 900 tons was a maximum day's run. The output was to be increased and was to be derived largely from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 279.

WENONAH (DOTT POST OFFICE). WENONAH MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 8333, 8334, 8335, 8336, 8424 (p. 279).

Mine.—Wenonah; Norfolk & Western district; a drift mine at Wenonah (Dott post office), 33 miles northwest of Bluefield on the Wide Mouth Branch of the Norfolk & Western Railway.

Coal bed.—Known in this field as Pocahontas No. 3. Carboniferous age, Pocahontas formation. Thickness, from 3 feet 9 inches to 4 feet 4 inches; dip, 1° W.; roof, hard, firm shale or sandstone; there are layers of shale and bony coal, as shown in the section, which stuck to the coal and caused a considerable loss of coal; floor, soft clay, containing thin layers of coal. Some clay became mixed with the coal in loading.

The bed was measured and sampled at four points by A. J. Hazlewood on July 22, 1909, as described below:

Sections of coal bed in Wenonah mine at Wenonah.

Section	A		B		C		D	
Laboratory No.	8336		8333		8335		8334	
Roof, hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11⅛	0	10⅜	0	12	0	11¾
Shale[a]	0	3¼	0	2¾	0	3	0	4
Coal, hard	0	5	0	6¼	0	6	0	4
Bony coal[a]	0	3¼	0	4¼	0	3	0	4½
Coal	2	3¾	1	10½	2	2½	2	½
Floor, soft underclay with smooth surface.								
Thickness of bed	4	2⅜	3	10⅛	4	2½	4	¾
Thickness of coal sampled	3	7⅞	3	3⅛	3	8½	3	4¼

[a] Not included in sample.

Section A (sample 8336) was cut from the face of left heading 2, off main entry 2, 2,000 feet from the drift mouth.

Section B (sample 8333) was cut from the face of left heading 2, off main entry 1.

Section C (sample 8335) was cut from the face of left heading 4, off main entry 1.

Section D (sample 8334) was cut from face of main entry 1.

A composite sample was made by mixing samples 8333, 8334, 8335, and 8336 for an ultimate analysis, the results of which are shown under laboratory No. 8424 (p. 279).

Notes.—The coal at this mine was undercut with chain machines in bottom part of bed, and was shot down with black powder. There were no screens at this mine, all of the coal being shipped in run-of-mine form. This is a coking coal, but there were no ovens at this plant. The coal was picked on a table and on the car by five trimmers. The daily output averaged 300 tons, and 550 tons was the maximum day's run. The output for the immediate future was to be derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 279.

WIDEMOUTH. PIEDMONT MINE.

Sample.—Semibituminous coal; Pocahontas field; analyses Nos. 10423, 10424, 10425, 10426, 10438 (p. 279).

Mine.—Piedmont; Norfolk & Western district; a slope mine ½ mile west of Widemouth, on the Pocahontas division of the Norfolk & Western Railway.

Coal bed.—Known as the Pocahontas No. 4 (?). Carboniferous age, Clark (?) formation. The coal in this mine varies from 4 feet 8 inches to 5 feet 1 inch in thickness. The roof and floor of this bed are of good quality. A "rash" varying from 1 to 4 inches occurs above the coal, but this is eliminated from run-of-mine coal at the tipple by passing the coal over a 4-inch bar screen. The coal from this bed is of a very good quality, and can easily be cleaned from the partings.

The bed was measured and sampled May 3, 1910, by A. A. Straub, as shown below:

Section of coal bed in Piedmont mine, ½ mile west of Widemouth.

Section	A		B		C		D	
Laboratory No.	10423		10424		10425		10426	
Roof, sandstone and soft rash.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	1	2	1	2	..	..	..	..
Cube coal [a]	..	..	..	..	0	2¼	0	2
Shale [a]	0	6⅞	0	7	..	..	..	..
Coal	..	..	3	⅝	1	2⅛	0	7⅝
Bone [a]	0	½	..	..	..	..	..	..
Coal	2	6	..	..	..	..	..	..
Mother coal	Streak.		..	..	0	⅜	0	⅜
Coal	0	4	..	..	0	¾	0	6
Shale [a]	..	..	..	..	0	6½	0	5⅝
Coal	..	..	..	..	1	9	1	1½
Mother coal	..	..	..	..	Streak.		0	¾
Coal	..	..	..	..	1	6¼	0	2¼
Mother coal	..	..	..	..	..	..	Streak.	
Coal	..	..	..	..	..	..	1	3¾
Shale [a]	..	..	..	..	..	..	0	2
Coal	..	..	..	..	..	..	0	3⅛
Floor, shale.								
Thickness of bed	4	7⅜	4	9⅝	5	3¼	4	11
Thickness of coal sampled	4	0	4	2⅝	4	6½	4	1⅜

[a] Not included in sample.

Section A (sample 10423) was cut from the face of room 2, off right heading 10, 2,600 feet southwest of the drift mouth.

Section B (sample 10424) was cut from the face of left entry 8, off main entry 1, 3,600 feet southwest of the drift mouth.

Section C (sample 10425) was cut from the face of left entry 2, off main entry in No. 3 mine, 900 feet north of the drift mouth.

Section D (sample 10426) was cut from face of main heading 2, 1,100 feet northeast of the drift mouth.

A composite sample was made by mixing samples 10423, 10424, 10425, and 10426 for an ultimate analysis, the results of which are shown under laboratory No. 10438.

Notes.—The coal in this mine was undercut with air punching machines, and was shot down with black powder. The tipple was equipped with a 4-inch bar screen, with 2-inch, 1½-inch, and 1⅝-inch revolving screens, a washer, and a picking table. The coal was picked on a picking table, and also on the car. The coal was screened over a 4-inch bar screen, all passing over this screen being shipped in run-of-mine form. The average output of the mine was about 500 tons daily, with a capacity of 700 tons per day. The unmined area was about 2,200 acres.

For chemical analyses of this coal see part I of this bulletin, p. 279.

MINERAL COUNTY.

ELK GARDEN. TYSON NO. 10 MINE.

Sample.—Semibituminous coal; Elk Garden field; analyses Nos. 472, 473, 483, 10458 (p. 280).

Mine.—Tyson No. 10; Potomac district; a drift mine at Elk Garden, on the Elk Garden Branch of the Western Maryland Railroad.

Coal bed.—Known in this field as the Sewickley. Carboniferous age, Monongahela formation. The bed as mined has an average thickness of 5 feet 4 inches, and varies from 5 feet 4 inches to 5 feet 10 inches. The roof is a soft sandstone with smooth surface, which breaks readily during the robbing of pillars. The floor is shale and fire clay, with smooth but rolling surface. In places pieces of the floor became mixed with the coal in mining.

The bed was measured and sampled at three points by P. M. Riefkin on April 20, 1910, as described below:

Sections of coal bed in Tyson No. 10 mine at Elk Garden.

Section	A		B		C	
Laboratory No.	472		473		483	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	2 5/8	0	3/4	..	..
Charcoal	0	1/16	..	..	..	..
Coal	1	3	1	3 1/8	1	9 1/4
Charcoal	0	1/16	0	1/16	..	..
Coal (bony)	..	..	0	2	0	2 1/8
Coal	1	1	1	0	0	11 5/8
Sulphur	0	1/16	0	1/16	0	1/16
Coal	..	..	0	2 1/2	..	..
Sulphur	..	..	0	1/8	..	..
Coal	2	9 1/2	2	6 1/4	2	5
Shale and coal [a]	..	..	..	..	0	1 3/4
Coal	..	..	..	..	0	4 1/2
Floor, soft shale.						
Thickness of bed	5	4 5/16	5	2 7/8	5	10 5/16
Thickness of coal sampled	5	1 11/16	5	2 1/8	5	8 9/16

[a] Not included in sample.

Section A (sample 472) was cut from pillar off room 4, off right heading, 160 feet northwest of drift mouth.

Section B (sample 473) was cut from pillar 6, off main air course, 430 feet southeast of drift mouth.

Section C (sample 483) was cut from heading pillar in neck of room 8 on right air course, 440 feet northwest of drift mouth.

A composite sample was made by mixing the pillar samples 472, 473, and 483 for an ultimate analysis, the results of which are shown under laboratory No. 10458.

Notes.—The coal at this mine was mined with pick and shovel, no explosive being used. There were no screens at the tipple, the entire output being loaded as run-of-mine coal. The mine was nearly worked out, and, at time of sampling in April, 1910, had a daily output of 150 tons, derived from pillars entirely.

For chemical analyses of this coal see part I of this bulletin, p. 280.

ELK GARDEN. OTT NO. 20 MINE.

Sample.—Semibituminous coal; Elk Garden field; analyses Nos. 484, 485, 10457 (p. 280).

Mine.—Ott No. 20; Potomac district; a drift mine, 1 mile north of Elk Garden, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 4 feet 4 inches and varies from 3½ to 5 feet. The roof is good, a shale which did not fall and get mixed with the coal. The floor is a hard shale.

The bed was measured and sampled at two points by George S. Pope on April 20, 1910, as described below:

Sections of coal bed in Ott No. 20 mine, 1 mile north of Elk Garden.

Section	A		B	
Laboratory No	484		485	
Roof, sandstone and draw slate.	*Ft.*	*in.*	*Ft.*	*in.*
Bone[a]	..	..	0	1
Coal (very hard)	0	5	0	5½
Bony coal[a]	0	¾	..	..
Shale[a]	..	..	0	4¾
Coal	2	9½	2	6
Black sulphur	0	¼	0	1½
Coal	0	2	..	..
Coal (dull gray)	0	10	..	..
Floor, hard shale.				
Thickness of bed	4	3½	3	6¾
Thickness of coal sampled	4	2¾	3	1

[a] Not included in sample.

Section A (sample 484) was cut from the face of the Baldwin heading.

Section B (sample 485) was cut from the face of the Atlantic heading.

A composite sample was made by mixing the face samples 484 and 485 for an ultimate analysis, the results of which are shown under laboratory number 10457.

Notes.—The coal at this mine was undercut in the bottom part of bed with hand picks, and was shot down with permissible explosives. There were no screens at the tipple, the entire output of coal being loaded in run-of-mine form. The mine had a capacity of 300 tons, and an average daily output of 150 tons, which was derived principally from advance work. Another opening was projected.

For chemical analyses of this coal see part I of this bulletin, p. 280.

Elk Garden. Elk Garden No. 6 Mine.

Sample.—Semibituminous coal; Elk Garden field; analyses Nos. 7626, 7627 (p. 280).

Mine.—Elk Garden No. 6; Potomac district; a drift mine, 1 mile southwest of Elk Garden, on the Western Maryland Railroad.

Coal bed.—Big Vein (Georges Creek or Pittsburgh). Carboniferous age, Monongahela formation. Roof and floor, shale.

The bed was measured and sampled at two points by P. M. Riefkin on April 21, 1909.

Sections of coal bed in Elk Garden No. 6 mine, 1 mile southwest of Elk Garden.

Laboratory No	7626		7627	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	10½	0	6
Splint coal	0	1½	1	2
Mother coal	..	..	0	1½
Coal	0	9½	0	9
Sulphur	0	½	..	..
Splint	..	..	0	1½
Coal	0	10	0	4
Mother coal	0	4	0	3½
Coal	2	2	0	3½
Sulphur	0	½	..	..
Coal	3	9	0	2
Shale[a]	0	½	..	..
Coal	0	10½	..	..
Coal	..	..	1	0
Mother coal	..	..	0	2
Coal	..	..	3	9
Shale[a]	..	..	0	1½
Coal	..	..	1	8¼
Floor, shale.				
Thickness of bed	9	10½	10	5¾
Thickness of coal sampled	9	10	10	4¼

[a] Not included in sample.

Sample 7626 was taken in room 5, off heading 3, 1,200 feet southeast of opening.

Sample 7627 was taken in room 2, off right heading 2, 700 feet south of opening.

Notes.—At time of inspection pillars were being pulled, and it was estimated that the mine would be worked out in within a year. Daily output, 300 tons. No men employed to pick coal.

For chemical analyses of this coal see part I of this bulletin, p. 280.

OAKMONT. KITTANNING NO. 14 MINE.

Sample.—Semibituminous coal; Elk garden field; analyses Nos. 492, 494, 10453 (pp. 280, 281).

Mine.—Kittanning No. 14; a drift mine, located in the Upper Potomac field, Potomac district; 1½ miles northwest of Oakmont, on the Elk Garden Branch of the Western Maryland Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 4 feet 4 inches, and varies from 4 feet 2 inches to 4 feet 6 inches. The roof is shale or bone. The floor is a hard fire clay or shale with an occasional roll.

The bed was measured and sampled at two points by P. M. Riefkin, on April 21, 1910, as shown below:

Sections of coal bed in Kittanning No. 14 mine, 1½ miles north of Oakmont.

Section	A		B	
Laboratory No.	492		494	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	4½	..	..
Coal (soft, bright)	..	..	0	9¾
Bony coal [a]	..	..	0	1¾
Coal (soft, bright)	0	10	0	2¼
Bony coal and shale [a]	0	4⅜	0	9½
Coal (firm)	0	8¼	1	7½
Charcoal	0	⅛	0	⅛
Coal	2	½	0	9
Floor, fire clay.				
Thickness of bed	4	3¾	4	3⅞
Thickness of coal sampled	3	6⅞	3	4⅝

[a] Not included in sample.

Section A (sample 492) was cut from the face of room 6, off line heading on dip entry 2.

Section B (sample 494) was cut from the face of right heading 2, off the Harrison heading, off the main heading.

A composite sample was made by mixing the face samples 492 and 494 for an ultimate analysis, the results of which are shown under laboratory No. 10453 (p. 281).

Notes.—The coal at this mine was undercut in bottom part of bed with hand picks, and was shot down with a permissible explosive. There were no screens, the entire output being shipped as run-of-mine coal. The trimmers picked the coal as it was loaded on the cars. In April, 1910, the mine had a daily average of 210 tons, the greater part of which was from pillar coal.

For chemical analyses of this coal see part I of this bulletin, pp. 280, 281.

WABASH. WABASH NO. 9 MINE.

Sample.—Semibituminous coal: Elk Garden field; analyses Nos. 493, 495, 10431 (p. 281).

Mine.—Wabash No. 9; Potomac district; a drift mine at Wabash, on the Elk Garden Branch of the Western Maryland Railroad.

Coal bed.—Known in this field as the Georges Creek or Pittsburgh. Carboniferous age, Monongahela formation. The bed as mined has an average thickness of 10½ feet, varying from 10 to 12 feet. The bed has a good shale roof with smooth surface. The floor is a hard shale with smooth surface and did not get mixed with the coal in mining.

The bed was sampled and measured at two points by George S. Pope on April 21, 1910, as described below:

Sections of coal bed in Wabash No. 9 mine at Wabash.

Section	A		B	
Laboratory No.	493		495	
Roof, smooth shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	1½	0	3
Coal	2	0	1	7
Coal (curly)	0	6	0	4½
Coal	2	3	2	3½
Coal (dull gray)	0	1¾	..	..
Coal (bright)	0	4½	..	..
Coal (dull gray)	0	3½	0	5¾
Coal	3	½	3	0
Sulphur [a]	0	½	..	..
Coal [a]	0	1	..	..
Shale [a]	0	4	0	4
Coal	1	2¼	1	3
Shale	0	¼	0	1¼
Coal	1	2	0	11¼
Shale and bone [a]	0	1½	0	2
Floor, hard smooth shale.				
Thickness of bed	11	8¼	10	9¼
Thickness of coal sampled	10	11¾	10	¼

[a] Not included in sample.

Section A (sample 493) was cut from pillar in room 2, off opening 12.

Section B (sample 495) was cut from face of opening 9, on the right of the main air course.

A composite sample was made by mixing the face samples 493 and 495 for an ultimate analysis, the results of which are shown under laboratory No. 10431 (p. 281).

Notes.—The coal at this mine was all dug with pick and shovel, no explosive being used. The mine was in the top of a hill and had a number of openings. There were no screens at the tipple, the coal being loaded in run-of-mine form. The mine at time of sampling in April, 1910, was approaching exhaustion, the entire output being derived from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 281.

MINGO COUNTY.

GLEN ALUM. GLEN ALUM MINE.

Sample.—Bituminous coal; Big Sandy field; (West Virginia No. 18) analyses Nos. 2348, 2349 (p. 281).

Mine.—Glen Alum; a drift mine in the Norfolk & Western district, at Glen Alum, on the Norfolk & Western Railway.

Coal bed.—Locally known as the War Eagle. Carboniferous age, Kanawha formation. At this mine the bed lies nearly flat and has an average thickness of about 5½ feet. Roof, in places, gray laminated shale and in places sandstone; floor, hard wet fire clay, shaly in places.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on October 20, 1905, as shown below:

Sections of coal bed in Glen Alum mine at Glen Alum.

Section	A		B	
Laboratory No.	2348		2349	
Roof: Sec. A, shale; sec. B, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11	1	2
Mother coal	0	¼	0	¼
Coal	4	4	5	0
Floor, fire clay.				
Thickness of bed	5	3¼	6	2¼
Thickness of coal sampled	5	3¼	6	2¼

Section A (sample 2348) was measured in a crosscut, 900 feet from the drift mouth.

Section B (sample 2349) was measured in room 19, off entry 20, 3,000 feet from the drift mouth.

The upper bench shown in the two sections is softer than the lower bench.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 213; Bureau of Mines Bull. 23, pp. 69, 187; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 214; Bureau of Mines Bull. 13, pp. 221, 276; coking tests: U. S. Geol. Survey Bull. 290, p. 215; Bull. 336, pp. 26, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses of this coal see part I of this bulletin, p. 281; also U. S. Geol. Survey Bull. 290, p. 213.

MONONGALIA COUNTY.

Morgantown. Richard Mine.

Sample.—Bituminous coal; (West Virginia No. 3) analyses Nos. 1108, 1109 (p. 281).

Mine.—Richard; a drift mine in the Monongahela district, 4 miles southeast of Morgantown, on the Morgantown & Kingwood Railroad.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation. At this mine the bed is broken into several benches by shale and fire clay, as shown by the following section given in West Virginia Geological Survey, volume 2, p. 417:

Section of coal bed in Richard mine, 4 miles southeast of Morgantown.

	Ft.	*in.*
Gray shale	..	..
Black slate	2	4
Impure cannel coal	0	6
Bony coal	0	8
Coal, "main bench"	2	10
"Little slate," gray	0	2
Coal, "mining ply"	1	2
"Big slate" (fire clay)	4	0
Coal "bottom"	1	4
Thickness	13	0

The bed lies nearly flat and is worked from the outcrop.

The portion mined corresponds, as shown by sections below, to the "main bench" and the "mining ply" of the above section.

Two sections were measured and sampled by J. S. Burrows in 1904, as shown below:

Sections of coal bed in Richard mine, near Morgantown.

Section	A		B	
Laboratory No.	1109		1108	
Roof, bone.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	8	2	8¼
Shale[a]	0	1½	0	1¾
Coal	1	0	1	6½
Thickness of benches	3	9½	4	4½
Thickness of coal sampled	3	8	4	2¾

[a] Not included in sample.

Section A (sample 1109) was measured in right entry 4, off the main entry, and section B (sample 1108) was measured in the airway near left entry 4.

Notes.—In 1904 about half the output of this mine, which averaged about 225 tons daily, was made into coke. The larger part of the remainder was shipped to large eastern cities, and some was used by locomotives on the Morgantown & Kingwood Railroad.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 833; briquetting tests: U. S. Geol. Survey Prof. Paper 48, p. 1450; Bull. 261, p. 165; washing tests: U. S. Geol. Survey Prof. Paper 48, pp. 1450, 1472; Bull. 261, p. 71; coking tests: U. S. Geol. Survey. Prof. Paper 48, p. 1355; Bull. 261, p. 127; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, p. 1376.

For chemical analyses see part I of this bulletin, p. 281; also U. S. Geol. Survey Prof. Paper 48, p. 250; Bull. 261, p. 54.

NICHOLAS COUNTY.

DELPHI. OUTCROP.

Sample.—Bituminous coal; Elk River field; analyses Nos. 1233, 1236 (p. 281).

Location.—Fresh exposure (waterfall) Kanawha-New River district; on branch of Righthand Fork of Muddlety Creek, 3 miles northwest of Delphi.

Coal bed.—"Wattsville;" possibly same as No. 5 block of Kanawha River; Allegheny formation, about horizon of Lower Kittanning coal of Pennsylvania; mostly splint, very hard. The roof is shale, 4 feet thick, overlain with sandstone; the floor is dark, drab clay.

The bed was measured and sampled by George H. Ashley and W. C. Phalen on October 4, 1904, as described below:

Sections of coal bed in country bank, 3 miles northwest of Delphi.

	1233, 1236	
Laboratory No	*Ft.*	*in.*
Roof, shale.		
Coal	6	1
Shale	0	4
Coal, splint	1	7
Shale	0	7
Coal	2	10
Floor, dark, drab clay.		
Thickness of bed	11	5

Sample 1233 was taken from the middle and bottom benches, 5-foot cut.

Sample 1236 was taken from the upper bench, 67-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 281; also U. S. Geol. Survey Prof. Paper 48, p. 274.

GILBOA. COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1363 (p. 281).

Location.—Country bank; Kanawha-New River district; head of Rader Fork of Twentymile Creek, about 3 miles northwest of Gilboa.

Coal bed.—"Wattsville." Carboniferous age, Allegheny formation. The roof is drab shale and the floor is clay. The coal appears to be a typical splint coal.

The bed was measured and sampled by W. C. Phalen on October 24, 1904, as shown below:

Section of coal bed in country bank, 3 miles northwest of Gilboa.

	1363	
Laboratory No	*Ft.*	*in.*
Roof, drab shale.		
Coal, splinty [a]	0	9
Bone [a]	0	1¾
Coal, splinty [a]	1	1
Coal, very splinty	2	10
Floor, clay.		
Thickness of bed	4	9¾
Thickness of coal sampled	3	11

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 281; also U. S. Geol. Survey Prof. Paper 48, p. 274.

HOOKERSVILLE. HUTCHINSON BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1362 (p. 281).

Location.—Hutchinson bank; Kanawha-New River district (stripping on outcrop) near Wood's field, east of Hookersville.

Coal bed.—"Wattsville," probably same as No. 5 block coal of Kanawha River. Carboniferous age, Allegheny formation, near position of Lower Kittanning. The coal contains many clay and bone partings.

The bed was measured and sampled by W. C. Phalen on October 19, 1904, as shown below:

Section[a] of coal bed in Hutchinson bank, east of Hookersville.

Laboratory No.	1362	
Roof, hard, massive sandstone.	*Ft.*	*in.*
Coal	0	6
Clay	1	9½
Coal, splinty	0	1
Clay	0	1
Coal	0	3
Bone	0	9
Coal, splinty	1	8
Bone or splint	0	1
Coal, splinty	0	9½
Bone or splint	0	1
Coal, splinty	0	5
Clay	0	2
Coal	0	2
Clay	0	5
Coal, good	0	5
Clay	0	½
Coal	0	7
Thickness of bed	8	3½

[a] It is assumed that the clay and the bone partings were rejected in cutting the sample.

For chemical analyses of this coal see part I of this bulletin, p. 281; also U. S. Geol. Survey Prof. Paper 48, p. 274.

SUMMERSVILLE. McRADER COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1581 (p. 282).

Location.—McRader country bank; Kanawha-New River district; on Buck Garden Creek, northeast of Gilboa and near Summersville.

Coal bed.—No. 2 Gas. Carboniferous (Pottsville) age, Kanawha formation. The coal has a shale roof and a clay floor.

The bed was measured and sampled by W. C. Phalen on November 2, 1904, as described below:

Section of coal bed in McRader country bank near Summersville.

Laboratory No.	1581	
Roof, shale.	*Ft.*	*in.*
Coal[a]	0	9
Bone[a]	0	3
Coal	1	11
Floor, clay.		
Thickness of bed	2	11
Thickness of coal sampled	1	11

[a] Not included in sample.

For chemical analyses of this coal, see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 274.

SUMMERSVILLE. COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1579 (p. 282).

Location.—Country bank on J. E. Sims farm, three-fourths mile from Summersville.

Coal bed.—No. 2 Gas. Carboniferous (Pottsville) age, Kanawha formation. Over the coal is 4 to 10 feet of shale, underlain with 40 feet of sandstone; below the coal is clay.

The bed was measured and sampled by W. C. Phalen on November 4, 1904, as shown below:

Section of coal bed in Sims country bank near Summersville.

Laboratory No.	1579
Roof, shale.	*Ft. in.*
Coal [a]	1 1
Bone [a]	0 1½
Coal	2 11½
Floor, clay.	
Thickness of bed	4 2
Thickness of coal sampled	2 11½

[a] Not included in sample.

The sample was taken from the entrance of the mine.

Notes.—The opening supplies a wagon trade for a short time in the fall, producing then about 12 tons a day, most of which was hauled to Summersville. The sandstone over this coal is massive and needs little timbering.

For chemical analyses of this coal see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 274.

SUMMERSVILLE. DUNBAR COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1582 (p. 282).

Location.—Dunbar country bank; Kanawha-New River district; on Fitzwater branch of Peters Creek, west of Summersville.

Coal bed.—No. 2 Gas. Carboniferous (Pottsville) age, Kanawha formation. The coal has a shale roof and clay floor.

The bed was measured and sampled by W. C. Phalen on November 1, 1904, as described below:

Section of coal bed in Dunbar country bank west of Summersville.

Laboratory No.	1582
Roof, shale.	*Ft. in.*
Coal, splinty [a]	1 1
Bone [a]	0 1¾
Coal, splinty	2 2
Floor, clay.	
Thickness of bed	3 4¾
Thickness of coal sampled	2 2

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 274.

SUMMERSVILLE. BACKUS COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1578 (p. 282).

Location.—Country bank; Kanawha-New River district; on a farm, 1 mile south of Summersville.

Coal bed.—No. 2 Gas. Carboniferous (Pottsville) age, Kanawha formation; roof, 5 feet of brown sandstone; floor, drab clay.

The bed was measured by George H. Ashley on October 20, 1901, as shown below:

Section of coal bed in Backus country bank, 1 mile south of Summersville.

	Ft.	*in.*
Roof, brown sandstone.		
Coal	1	0
Clay parting[a]	0	½
Coal	3	3
Floor, drab clay.		
Thickness of bed	4	3½
Thickness of coal sampled	4	3

[a] Not included in sample.

Sample 1578 was obtained from a pile at stripping by throwing together about a bushel and quartering down.

For chemical analyses of this coal see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 274.

SUMMERSVILLE. NEFF STRIPPING.

Sample.—Bituminous coal; Elk River field; analysis No. 1583 (p. 282).

Location.—Stripping; Kanawha-New River district; on a farm at head of McKee Creek, 1 mile west of Summersville.

Coal bed.—No. 2 Gas. Carboniferous (Pottsville) age, Kanawha formation. Over bed is 4 feet of dark-drab shale, overlain with 6 inches of light-brown shale. The floor is clay.

The bed was measured and sampled by George H. Ashley on November 4, 1904, as follows:

Section of coal bed in Neff stripping, 1 mile west of Summersville.

Laboratory No	1583	
Roof, dark-drab shale.	*Ft.*	*in.*
Coal	1	3
Bone[a]	0	2½
Coal	3	7
Floor, clay.		
Thickness of bed	5	½
Thickness of coal sampled	4	10

[a] Not included in sample.

Sample 1583 includes a small stripping cutting taken only a few feet back from outcrop.

For chemical analyses of this coal see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 274.

PRESTON COUNTY.

BRETZ. BRETZ MINE.

Sample.—Bituminous coal; Tygart River field; (West Virginia No. 4) analyses Nos. 1116 and 1117, and analyses Nos. 2054, 2055 (p. 282).

Mine.—Bretz; Monongahela district; a drift mine at Bretz, 7 miles northwest of Kingwood, on the Morgantown & Kingwood Railroad.

Coal bed.—Upper Freeport. Carboniferous age, Allegheny formation. Thickness and partings about the same as in Richards mine; roof, sandstone, The bed was measured and sampled at two points by J. S. Burrows on September 13, 1904, as described below:

Sections of coal bed in Bretz mine at Bretz.

Section	A		B	
Laboratory No	1117		1116	
Roof, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Draw slate	0	6	0	6
Coal	1	2	1	2
Bone	0	8	0	8
Coal	1	11	..	..
Coal	..	..	2	½
Shale [b]	0	2½	..	..
Shale [b]	[a] ..	..	[a] 0	2¼
Coal	1	½	..	..
Coal	..	..	1	1¼
Shale	0	½	..	..
Shale	..	..	0	½
Coal	0	4	0	4
Shale	0	8	0	8
Coal	1	6	1	6
Thickness of bed	8	½	8	2½
Thickness of coal sampled	3	0	3	1¾

[a] Part worked. [b] Not included in sample.

Section A (sample 1117) was measured in the first left room, off the main entry.

Section B (sample 1116) was measured in the first right room, off the main entry.

The bed was also sampled at two points by W. J. von Borries and J. W. Groves on August 25, 1905, as shown below:

Sections of coal bed in Bretz mine at Bretz.

Section	C		D	
Laboratory No	2054		2055	
Roof, sec. C, sandstone and shale; sec. D, shale	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	2	3
Mother coal	0	¼	..	..
Shale [a]	..	..	0	2
Coal	1	3	1	0
Mother coal	0	½	..	..
Coal	0	10	..	..
Shale [a]	0	2	..	
Coal	1	1	..	..
Shale [a]	0	½	..	..
Coal	0	2½	..	..
Floor, shale.				
Thickness of bed	4	3¾	3	5
Thickness of coal sampled	4	1¼	3	3

[a] Not included in sample.

Section C (sample 2054) was measured in left heading 2, off the main entry, 1,300 feet from the mine opening.

Section D (sample 2055) was measured in the right butt entry 3, off the main entry, 800 feet southeast of the mine opening.

Notes.—The benches worked carry bright, clean coal that is somewhat soft and friable. When the mine was inspected in 1904, it had been in operation only a little over a year.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 841; Bull. 261, p. 82; Bureau of Mines Bull. 23, p. 69; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1239; Bull. 261, p. 111; Bureau of Mines Bull. 13, p. 216, 276; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1472; Bull. 261, p. 71; Bull. 290, p. 200; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1357; Bull. 261, p. 127; Bull. 290, p. 200; Bull. 336, pp. 25, 34, 43; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, pp. 1377, 1378; Bull. 336, pp. 51, 52, 55, 57, 61, 64.

For chemical analyses see part I of this bulletin, p. 282; also U. S. Geol. Survey Prof. Paper 48, p. 251; Bull. 261, p. 54; Bull. 290, p. 199.

BRETZ. COUNTRY BANK.

Sample.—Bituminous coal; Tygart River field; (West Virginia No. 17) analyses Nos. 2056, 2057 (p. 283).

Location.—Prospect hole one-fourth mile from the country bank, from which car sample was shipped; Monongahela district, 2½ miles above Bretz, on the Morgantown & Kingwood Railroad.

Coal bed.—Bakerstown of the West Virginia Geological Survey. Carboniferous age, Conemaugh formation. At this mine it lies nearly flat, and is more than 3 feet 6 inches thick. The roof is a sandy shale, and the floor is fire clay.

The bed was measured and sampled at two points by J. W. Groves and W. J. von Borries on August 26, 1905.

Section A (sample 2056) represented 3 feet 4 inches of coal. It was measured at the head of the main entry, 200 feet from the mine opening.

Section B (sample 2057) represented 3 feet 7 inches of coal. It was measured in right offset 1, 175 feet from the mine opening.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 290, p. 211; Bureau of Mines Bull. 23, pp. 69, 186; washing tests: U. S. Geol. Survey Bull. 290, p. 212; Bull. 336, p. 12; coking tests: U. S. Geol. Survey Bull. 290, p. 212; Bull. 336, pp. 26, 35, 44; cupola tests of coke: U. S. Geol. Survey Bull. 336, pp. 52, 55, 58, 61, 64.

For chemical analyses of this coal see part I of this bulletin, p. 283; also U. S. Geol. Survey Bull. 290, p. 211.

RALEIGH COUNTY.

BECKLEY. SPRAGUE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8015, 8016, 8017, 8104, 8899, 8900 (p. 283).

Mine.—Sprague; Kanawha-New River district; a drift mine one-half mile from Beckley, on the Cranberry Branch of the Chesapeake & Ohio Railway.

Coal bed—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, uniform, ranging as mined from 4 feet 1 inch to 4 feet 10⅝ inches; roof, slate; floor, hard shaly underclay.

The bed was measured and sampled at three points by F. J. Simington, on June 24, 1909, and at two points by A. J. Hazlewood on August 14, 1909, as described below:

Sections of coal bed in Sprague mine, ½ mile from Beckley.

Section	A		B		C		D		E	
Laboratory No.	8015		8016		8017		8899		8900	
Roof, shale; sections D and E, "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	[a]0	1⅞	..	..	[a]0	2	[a]0	1½	[a]0	2
Clay or shale	..	..	..	..	[a]0	½	[a]0	½	[a]0	¾
Coal	1	11	1	10⅝	3	11⅛	1	11¼	1	10½
Mother coal	..	..	..	..	0	⅜	..	..	..	..
Gray splint	0	4	0	1	..	..	0	10¼	0	6
Coal (in places thin sulphur and mother-coal streaks)	2	1⅛	1	10½	..	8½	1	5½	1	7½
Bone and sulphur	..	..	[a]0	2¼	..	..	..	..	..	..
Floor, hard shaly underclay; section E, soft.										
Thickness of bed	4	6	4	⅜	4	10½	4	5	4	2¾
Thickness of coal sampled	4	4⅛	3	10⅛	4	8	4	3	4	0

[a] Not included in sample.

Section A (sample 8015) was cut from the rib near the face of the main entry, 3,000 feet from drift mouth.

Section B (sample 8016) was cut from the face of left entry 3, 3,000 feet from drift mouth.

Section C (sample 8017) was cut from the face of right entry 4, 2,500 feet from drift mouth.

Section D (sample 8899) was cut from the face of left entry 5, 4,000 feet from drift mouth.

Section E (sample 8900) was cut from the face of left entry 2, 2,500 feet from drift mouth.

A composite sample was made by mixing samples 8015, 8016, and 8017 for an ultimate analysis, the results of which are shown under laboratory No. 8104.

Notes.—The coal at this mine was undercut by hand and shot down with a permissible explosive. The tipple had screens, the openings of the screens being 4 inches and 1¾ inches, producing lump, egg, and slack. The daily output, at time of sampling in 1909, averaged 500 tons.

For chemical analyses of this coal see part I of this bulletin, p. 283.

BECKLEY. RALEIGH NO. 5 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8259, 8260, 8261, 8310 (p. 283).

Mine.—Raleigh No. 5; Kanawha-New River district; a drift mine one-half mile west of Beckley, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Average thickness, as mined, 3½ feet; dip, 2° W.; main roof, soft shale of poor quality, 6 to 8 inches being "draw slate;" floor, soft underclay with smooth but rolling surface; cover, 30 to 180 feet.

The bed was measured and sampled at three points by A. J. Hazlewood on July 16, 1909, as described below:

Sections of coal bed in Raleigh No. 5 mine, ½ mile west of Beckley.

Section	A		B		C	
Laboratory No	8261		8260		8259	
Roof, soft shale, poor quality.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft bony coal[a]	..	..	0	2	..	..
Coal (fragile)	3	4	3	3¼	3	9
Floor, soft shale with smooth surface.						
Thickness of bed	3	4	3	5¼	3	9
Thickness of coal sampled	3	4	3	3¼	3	9

[a] Not included in sample.

Section A (sample 8261) was cut from face of left entry 4, 1,800 feet from drift mouth.

Section B (sample 8260) was cut from face of right entry 4, 1,800 feet from drift mouth.

Section C (sample 8259) was cut from face of left entry 3, 1,400 feet from drift mouth.

A composite sample was made by mixing samples 8259, 8260, and 8261 for an ultimate analysis, the results of which are shown under laboratory No. 8310.

Notes.—The coal at this mine was mined by hand at top of bed and was shot down with permissible explosives. The plant had no screens, the total output being shipped as run-of-mine coal. The average daily output at the time of sampling was 250 tons, and 500 tons was a maximum day's run. The output for the immediate future was to be about the same and was to be derived from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 283.

BECKLEY. BECKLEY MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8013, 8014, 8043, 8044, 8045, 8106 (pp. 283, 284).

Mine.—Beckley; Kanawha-New River district; a slope mine 1½ miles from Beckley, on the Piney Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, uniform, ranging as mined from about 3 feet 10 inches to 4 feet 11 inches; main roof, sandstone; immediate roof, generally shale; floor, shaly underclay.

The bed was measured and sampled at two points on June 23, and at three points on June 28, 1909, by F. J. Simington, as described below:

Sections of coal bed in Beckley mine, 1½ miles from Beckley.

Section	A		B		C		D		E	
Laboratory No	....		8014		8043		8044		8045	
Roof, sandstone and shale	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Sulphurous bone	..	..	[a] 0	1½	..	..	..	..	[a] 0	1
Coal (mother-coal streaks in places)	1	10½	0	4⅝	2	¼	0	5½	2	3½
Pyrite	[a] 0	¼	0	⅛	..	..	..	..	..	..
Hard gray coal	..	..	..	..	0	2	0	5¾	0	1
Sulphur	..	..	..	..	..	..	[a] 0	⅜	..	..
Coal	2	3½	1	9⅞	1	4	0	7½	1	2⅞
Mother coal	..	..	..	..	..	..	..	..	0	¾
Bone	..	..	..	..	..	..	[a] 0	1⅜	..	..
Coal	..	..	..	..	..	..	2	2	0	7¼
Bone and coal	[a] 0	⅜	[a] 0	2¼	[a] 0	5¼	..	..	..	..
Coal	..	..	2	4½	..	..	..	..	..	..
Floor, shaly underclay.										
Thickness of bed	4	2⅝	4	10⅞	3	11½	3	10½	4	4⅜
Thickness of coal sampled	4	2	4	7⅛	3	6¼	3	8¾	4	3⅜

[a] Not included in sample.

Section A was cut from room 23, off south entry 1, off right entry 6, about 4,200 feet south of the slope.

Section B (sample 8014) was cut from face of the main entry, about 4,600 feet south of the slope.

Section C (sample 8043) was cut from rib near face of north entry 3, off dip entry, about 3,500 feet west of slope.

Section D (sample 8044) was cut from face of south entry 3, off right entry 6, about 4,000 feet southwest of slope.

Section E (sample 8045) was cut from rib near face of rock heading, about 3,500 feet southwest of slope.

A composite sample was made by mixing samples 8013, 8014, 8043, 8044, and 8045 for an ultimate analysis, the results of which are shown under laboratory No. 8106.

Notes.—The entire output of this mine was shipped as run-of-mine coal. All mining was done by hand, the coal being shot down with permissible explosives. The daily output at time of sampling was said to average about 600 tons, 1,000 tons being about the capacity of the mine.

For chemical analyses of this coal see part I of this bulletin, pp. 283, 284.

BECKLEY. MABSCOT AND MABSCOT NO. 2 MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8011, 8012, 8046, 8895, 8896, 8111 (p. 284).

Mines.—Mabscot and Mabscot No. 2; Kanawha-New River district; drift mines, operating in the same bed and dumping over the same tipple, 1½ miles from Beckley (Mabscot P. O.), on the Piney Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as Sewell. Carboniferous age, Sewell formation. Thickness of the coal as mined, 3 feet 9 inches to 4 feet 6 inches (except in the vicinity of rolls); roof, sometimes underlain with a few inches of "draw slate;" floor, soft shaly underclay.

The bed was measured and sampled at two points on June 22, 1909, and at one point on June 28, 1909, by F. J. Simington, and later at two points by A. J. Hazlewood, as described on the following page.

Sections of coal bed in Mabscot and Mabscot No. 2 mines, 1½ miles from Beckley.

Section	A		B		C		D		E	
Laboratory No	8011		8012		8046		8895		8896	
Roof, shale; section E, "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone	..	..	[a] 0	2¼	..	..	..	..	..	..
"Top coal"	..	..	..	..	[a] 0	1¼	..	..	..	..
Sulphur	..	..	..	..	[a] 0	2	..	..	..	..
Coal	1	11	1	10½	1	7¼	2	2	1	8
Bone	[a] 0	2¼	[a] 0	2	[a] 0	2¼	..	..	[a] 0	2
Coal	1	8½	1	9½	2	½	..	..	1	2½
Hard gray coal	..	..	..	..	..	..	[a]0	1½	..	..
Coal (mother-coal streaks)	..	..	..	..	..	..	2	1½	..	8¾
Bone (in places mother-coal streaks)	[a] 0	3¼	[a] 0	¾	..	..	..	..	..	..
Floor, soft, shaly underclay.										
Thickness of bed	4	1	4	1	4	1¼	4	5	3	9¼
Thickness of coal sampled	3	7½	3	8	3	7¾	4	3½	3	7¼

[a] Not included in sample.

Section A (sample 8011) was cut from the face of the main entry, about 4,000 feet south of drift mouth.

Section B (sample 8012) was cut from room 2, off left entry 3, off right entry 3, about 3,500 feet southwest of drift mouth.

Section C (sample 8046) was cut from pillar 17, off left entry 8, about 2,500 feet southeast of drift mouth.

Section D (sample 8895) was cut from face of the main entry in Mabscot No. 2 mine, about 100 feet west of drift mouth.

Section E (sample 8896) was cut from the face of right air course 2, about 800 feet southwest of drift mouth.

A composite sample was made by mixing samples 8011, 8012, and 8046 for an ultimate analysis, the results of which are shown under laboratory No. 8111.

Notes.—Mabscot No. 2 mine at the time of sampling was a new opening; it was to be eventually connected underground to No. 1 mine. The coal was mined entirely by hand, and was shot down with permissible explosives. The tipple was not equipped with screens, and consequently the entire output was shipped as run-of-mine coal. The daily output at the time of sampling averaged about 350 tons, and 500 tons was the capacity of the mines.

For chemical analyses of this coal, see part I of this bulletin, p. 284.

Cranberry. Cranberry Mine.

Sample.—Semibituminous coal; New River field; analyses Nos. 8037, 8038, 8039, 8897, 8898, 8114 (pp. 284, 285).

Mine.—Cranberry; Kanawha-New River district; a shaft mine, 470 feet in depth, at Cranberry, on the Cranberry Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, as mined, about 3 feet 8 inches to 4 feet 10 inches; roof, shale, between which and the coal there is in places a "draw slate;" floor, soft shaly underclay.

The bed was measured and sampled at two points on June 26, 1909, and at one point on June 28, 1909, by F. J. Simington, and at two points on August 12, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Cranberry mine at Cranberry.

Section	A		B		C		D		E	
Laboratory No	8037		8038		8039		8897		8898	
Roof, shale; sections B and D, "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (in places mother-coal streaks)	1	9½	1	8	1	8	1	8½	1	7½
Hard gray coal	0	1¾	0	3	0	2	1	8½	1	2½
Coal	2	10	2	1	2	7¾	1	2½	0	10
Bone [a]	..	..	..	..	..	..	..	..	0	1
Floor, soft shaly underclay.										
Thickness of bed	4	9¼	4	0	4	5¾	4	7½	3	9
Thickness as sampled	4	9¼	4	0	4	5¾	4	7½	3	8

[a] Not included in sample.

Section A (sample 8037) was cut from face of main east entry, about 2,500 feet east of shaft.

Section B (sample 8038) was cut from face of left entry 3, about 2,000 feet northeast of shaft.

Section C (sample 8039) was cut from face of right entry 4, about 2,500 feet southeast of shaft.

Section D (sample 8897) was cut from face of right air course 3, about 200 feet southeast of shaft.

Section E (sample 8898) was cut from room 5, off left air course 2, about 1,500 feet northeast of shaft.

A composite sample was made by mixing samples 8037, 8038, and 8039 for an ultimate analysis, the results of which are shown under laboratory No. 8114.

Notes.—The coal was undercut in the bed with punching machines, and was shot down with a permissible explosive. The tipple had bar screens with 2-inch openings. The daily output at the time of sampling averaged about 400 tons, 500 tons being the capacity of the mine.

For chemical analyses of this coal, see part I of this bulletin, pp. 284, 285.

CRANBERRY. PROSPERITY MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8008, 8009, 8010, 8109, (p. 285).

Mine.—Prosperity; Kanawha-New River district; a shaft mine, 535 feet in depth; ½ mile from Cranberry, on the Cranberry Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 3 feet 6⅛ inches to 4 feet 4¼ inches; roof, fairly strong shale; floor, hard shaly underclay.

The bed was measured and sampled at three points by F. J. Simington on June 25, 1909, as described below:

Sections of coal bed of Prosperity mine, ½ mile from Cranberry.

Section	A		B		C	
Laboratory No	8009		8009		8010	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	7	..	..	..	..
Mother coal	0	¼	..	..	..	..
Coal	1	7⅜	3	6½	1	6¼
Gray "splint" coal	0	2⅜	..	..	0	2
Bony coal [a]	..	..	0	2	..	..
Coal	1	8⅛	0	7¾	1	9⅞
Floor, shale.						
Thickness of bed	4	1⅛	4	4¼	3	6⅛
Thickness of coal sampled	4	1⅛	4	2¼	3	6⅛

[a] Not included in sample.

Section A (sample 8008) was cut from the face of the dip entry, 1,000 feet from shaft bottom.

Section B (sample 8009) was cut from the face of the main north entry, 2,000 feet from shaft bottom.

Section C (sample 8010) was cut from the face of the main rise entry, 1,500 feet from shaft bottom.

A composite sample was made by mixing samples 8008, 8009, and 8010 for an ultimate analysis, the results of which are shown under laboratory No. 8109.

Notes.—The coal from this mine was undercut in the bottom part of bed with machines, and was shot down with permissible explosives. The tipple was equipped with bar screens with 1½-inch openings. The daily output at time of sampling and measurement in 1909 averaged 200 tons, and 250 tons was a maximum day's run. The future output was to be derived from both advance work and pillars.

For chemical analyses of this coal see part I of this bulletin, p. 285.

ECCLES. ECCLES NO. 1 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8279, 8280, 8281. 8314 (p. 285).

Mine.—Eccles No. 1; Kanawha-New River district; a shaft mine, 130 feet in depth at Eccles, on the Piney Creek Branch of the Chesapeake & Ohio Railway and on the Virginian Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, fairly uniform, ranging as mined from 5 to 6 feet and dipping gently to the west; roof, fairly hard blue shale underlain with "draw slate" and capped with strong bedded sandstone 5 feet above; floor, fairly hard underclay with smooth surface; cover for most part more than 150 feet thick.

The bed was measured and sampled at three points by A. J. Hazlewood on July 9, 1909, as described below:

Sections of coal bed in Eccles No. 1 mine at Eccles.

Section	A		B		C	
Laboratory No	8280		8279		8281	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, draw slate.						
Coal	2	1½	1	11⅝	1	10½
Bony coal [a]	1	1	1	2½	0	9¼
Coal	2	5¼	2	6	2	6¼
Floor, fairly hard underclay.						
Thickness of bed	5	7¾	5	8⅛	5	2
Thickness of coal sampled	4	6¾	4	5⅝	4	4¾

[a] Not included in sample.

Section A (sample 8280) was cut from the face of the main north entry, 431 feet rom shaft.

Section B (sample 8279) was cut from the face of room 1 on the southeast entry, 210 feet from shaft.

Section C (sample 8281) was cut from the face of the main south entry.

A composite sample was made by mixing samples 8279, 8280, and 8281 for an ultimate analysis, the results of which are shown under laboratory No. 8314.

Notes.—This was a new mine at the time of sampling. The coal was undercut by hand in bottom part of bed, and was shot down with a permissible explosive. The entire output was being shipped as run-of-mine coal. This is a coking coal but there were no ovens at the plant. The coal was picked on car by one trimmer. The daily output averaged 250 tons, but a much larger output was planned. The tonnage for some time was to be derived from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 285.

GLEN WHITE. GLEN WHITE MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8901, 8902, 8938 (p. 285).

Mine.—Glen White; Kanawha-New River district; a shaft mine, 310 feet in depth, at Glen White, on the Shockley Branch of the Virginia Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. The coal bed averages 8 feet in thickness and has at this place a sandstone roof, between which and the coal is a "draw slate" of 10 inches in thickness. The floor is a hard sandstone. The cover over the coal is 300 to 400 feet thick.

The bed was measured and sampled at two points by A. J. Hazlewood on August 13, 1909, as described on the following page.

Sections of coal bed in Glen White mine at Glen White.

Section	A		B	
Laboratory No	8901		8902	
Roof, sandstone and "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	2	..	..
Coal (fragile)	1	10	2	0
Bony coal [a]	0	2	0	¾
Coal (fragile)	1	0	0	8½
Coal (splint, good)	1	0	1	5
Coal (fragile)	1	10	1	6
Bony coal (coal and shale layers) [a]	2	8	0	10
Coal (fragile)	3	3	3	2¾
Floor, hard, sandy underclay.				
Thickness of bed	11	11	9	9
Thickness of coal sampled	8	11	8	10¼

[a] Not included in sample.

Section A (sample 8901) was cut from the face of entry 1, 250 feet from No. 1 shaft.

Section B (sample 8902) was cut from the face of main air course, 400 feet east of shaft No. 2.

A composite sample was made by mixing the face samples 8901 and 8902 for an ultimate analysis, the results of which are shown under laboratory No. 8938.

Notes.—The coal at this mine was undercut by hand, and was shot down with a permissible explosive. The tipple in use in July, 1909, was a temporary one and the coal was being shipped in run-of-mine form. The output was 375 tons daily. This was a new mine. The output for some time was to be derived from advance work, and was expected to increase. A shaft house with oscillating bar screens was being erected.

For chemical analyses of this coal see part I of this bulletin, p. 285.

GRAHAM. GRAHAM MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8086, 8087, 8088, 8165 (pp. 285, 286).

Mine.—Graham; Kanawha-New River district; a drift mine, at Graham, on the Kanawha, Glen Jean & Eastern Railway, contributory to the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, uniform, ranging as mined from 4 feet to 5 feet 4 inches; roof, clay shale capped with strongly bedded sandstone; floor, hard, blue, shaly underclay.

The bed was measured and sampled at three points by H. M. Wolflin on July 2, 1909, as described below:

Sections of coal bed in Graham mine at Graham.

Section	A		B		C	
Laboratory No	8086		8087		8088	
Roof, blue shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Soft coal	0	7¼	0	5½	0	6
Grayish coal	1	0	1	1	1	1⅜
Hard gray coal	0	1½	0	1	0	¾
Grayish coal	0	8⅛	0	10½	0	7
Bright coal (mother-coal streaks)	2	¼	0	10½	1	6
Mother coal	..	..	0	½	..	..
Bright coal (mother-coal streaks)	..	..	0	5¼	..	..
Mother coal	..	..	0	¾	..	..
Bright coal	..	..	0	1½	..	..
Shale [a]	..	..	..	..	0	9
Soft dirty coal [a]	..	..	..	..	0	8½
Floor, hard, blue, shaly underclay.						
Thickness of bed	4	5⅛	4	½	5	2⅝
Thickness of coal sampled	4	5⅛	4	½	3	9⅛

[a] Not included in sample.

Section A (sample 8086) was cut from face of left air course 5, about 3,600 feet approximately southwest of drift mouth.

Section B (sample 8087) was cut from room 32, off left entry 2, about 2,900 feet approximately south of drift mouth.

Section C (sample 8088) was cut from room 2, off air course of Sidney entry, about 200 feet approximately northwest of drift mouth.

A composite sample was made by mixing samples 8086, 8087, and 8088 for an ultimate analysis, the results of which are shown under laboratory No. 8165.

Notes.—The coal at this mine was undercut in bottom part of bed with electric punchers and by hand, and was shot down with a permissible explosive. The tipple was equipped with bar screens with ¾-inch, 1¼-inch, and 3-inch openings. The coal was picked on the car. The daily output averaged about 300 tons, 550 tons being a maximum day's run. This was a new mine, and large increase of capacity was planned. The output for some time was to be derived almost entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, pp. 285, 286.

GRAHAM. TAMROY MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8129, 8130, 8131, 8184 (p. 286).

Mine.—Tamroy; Kanawha-New River district; a drift mine 1 mile from Graham (Tamroy P. O.) on the Kanawha, Glen Jean & Eastern Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform, ranging as mined from 4 feet 2 inches to 4 feet 11 inches; roof, sandstone, underlain with shale, between which and the coal is in places a few inches of clay which fell with the coal and mixed with it to some extent in loading; floor, hard, blue shale which did not mix with coal in loading; cover for the most part more than 300 feet thick.

The bed was measured and sampled at three points by H. M. Wolflin on July 6, 1909, as described below:

Sections of coal bed in Tamroy mine, 1 mile from Graham.

Section	A		B		C	
Laboratory No.	8129		8130		8131	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof: Section A, shale; sections B and C, draw clay.						
Soft coal	0	8	0	5¾	0	6½
Gray coal	1	1½	1	¾	1	½
Hard gray coal	0	1⅜	0	1¼	0	1¼
Gray coal	0	10	0	5½	1	0
Bright coal (mother-coal streaks)	0	10¼	2	4½	1	7¼
Mother coal	0	⅜	..	..	..	..
Bright coal (mother-coal streaks)	1	3⅛	..	..	..	..
Floor, hard, blue, shaly underclay.						
Thickness of bed	4	10⅝	4	5¾	4	4½
Thickness of coal sampled	4	10⅝	4	5¾	4	4½

Section A (sample 8129) was cut from face of main entry 1, about 1,200 feet approximately southeast of drift mouth.

Section B (sample 8130) was cut from face of west entry 2, about 500 feet southwest of opening.

Section C (sample 8131) was cut from face of main air course 3, about 750 feet southeast of opening.

A composite sample was made by mixing samples 8129, 8130, and 8131 for an ultimate analysis, the results of which are shown under laboratory No. 8184.

Notes.—The coal was undercut by hand in the bottom part of bed, and was shot down with a permissible explosive. The tipple had no screens, and consequently the entire output was shipped as run-of-mine coal. The coal was picked on the car. The daily output at time of sampling in 1909 averaged about 200 tons, a maximum day's run being about 250 tons, but a much larger output was planned. The output for some time to come was to be derived entirely from advance work. Output of mine in fiscal year 1910, 38,456 long tons.

For chemical analyses of this coal see part I of this bulletin, p. 286.

LANARK. LANARK NO. 3 AND NO. 4 MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8356, 8357, 8422, 8303, 8304, 8305, 8316 (pp. 286, 287).

Mines.—Lanark No. 3 and No. 4; Kanawha-New River district; drift mines 1 mile west of Lanark, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness of the coal as mined from 4 feet 6 inches to 5 feet 4 inches; roof, "slippy" shale, which in places came down as a "draw slate" and in a part of the mine was so soft for about an inch immediately above the coal as to make mud that came down with the coal; floor, hard gray underclay; cover for the most part from 30 feet to 150 feet thick.

The bed was measured and sampled in five places by A. J. Hazlewood and J. W. Groves on July 19, 1909, as described below:

Sections of coal bed in Lanark No. 3 mine, 1 mile west of Lanark.

Section	A		B	
Laboratory No.	8357		8356	
Roof, gray shale.	Ft.	in.	Ft.	in.
Coal	4	0	1	0
Hard coal	..	..	0	1½
Coal	..	..	1	5½
Sulphur ball [a]	..	..	0	1
Coal	..	..	1	8½
Mother coal	0	¾	0	½
Coal	0	8	0	8½
Floor, hard underclay.				
Thickness of bed	4	8¾	5	1½
Thickness of coal sampled	4	8¾	5	½

[a] Not included in sample.

Section A (sample 8357) was cut from a pillar in right entry 3, 1,700 feet northeast of the drift mouth.

Section B (sample 8356) was cut from a pillar in right entry 2, 1,500 feet east of the drift mouth.

A composite sample was made by mixing samples 8356 and 8357 for an ultimate analysis, the results of which are shown under laboratory No. 8422.

Sample 8305 represented 4 feet 11¾ inches of coal. It was cut from a pillar near the face of right entry 3, 1,500 feet southeast of the drift mouth of Lanark No. 4 mine.

Sample 8303 represented 4 feet 5½ inches of coal. It was cut from a crosscut near the face of the main entry, 2,500 feet west of the drift mouth of Lanark No. 4 mine.

Sample 8304 represented 4 feet 7 inches of coal. It was cut from room 18 off right entry 5, 2,400 feet from the drift mouth of Lanark No. 4 mine.

A composite sample was made by mixing the samples 8303, 8304, and 8305 for an ultimate analysis, the results of which are shown under laboratory No. 8316.

Notes.—The coal at these two mines was undercut with hand picks, and was shot down with black powder. The coal was not screened, the output being sold as run of mine. It was picked as it was loaded on the cars. The daily output of Lanark No. 4 mine was 350 tons, and its capacity was 550 tons. It had an unmined area of 80 acres and most of the coal was to be from advance work. Lanark No. 3 was a small mine working pillar coal entirely. The average daily output was 100 tons. The coal from

Lanark No. 3 and No. 4 mines was mixed at the drum house and was loaded together on the railroad cars. The estimated output of the two mines was 450 tons daily and the capacity 650 tons.

For chemical analyses of this coal see part I of this bulletin, pp. 286, 287

OSWALD. OSWALD MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8081, 8082, 8083, 8245, 8162, 8691 (p. 287).

Mine.—Oswald; Kanawha-New River district; a drift mine, at Oswald, on the Kanawha, Glen Jean, and Eastern Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age; Sewell formation. Thickness, as mined, from about 3 to 4½ feet; roof, sandstone, underlain with a massive, blue shale, between which and the coal there is in places a thin layer of bone; floor, hard, blue, shaly underclay with smooth surface.

The bed was measured and sampled at four points on June 26 to 30, 1909, by H. M. Wolflin, and at one point on August 5, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Oswald mine at Oswald.

Section	A		B		C		D		E	
Laboratory No.	8081		8082		8083		8245		8691	
Roof, section A, shale and bone; sections B, D, and E, shale; section C, sandstone.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	11¼	1	7¼	..	..	1	7	..	..
Sulphurous coal	..	..	..	..	0	11¼	..	..	0	8
Mother coal	..	..	..	..	0	¼	..	..	..	..
Coal	..	..	..	..	0	7	..	..	1	0
Hard gray coal	0	¾	0	10	0	7	0	1	1	2
Coal (in places mother-coal streaks)	0	8	1	2	1	7½	2	½	1	1½
Bone[a]	..	..	..	..	..	..	0	1½	..	..
Coal (slate streaks)	..	..	0	2	..	..	..	..	..	..
Coal (in places mother-coal streaks)	1	4	0	5¾	..	..	0	8½	..	..
Floor, hard, blue, shaly underclay, smooth surface.										
Thickness of bed	3	0	4	3	3	9	4	6½	3	11½
Thickness of coal sampled	3	0	4	3	3	9	4	5	3	11½

[a] Not included in sample.

Section A (sample 8081) was cut from the face of right air course 7 (Peters place), off new main entry, about 2,500 feet approximately southeast of drift mouth.

Section B (sample 8082) was cut from room 8, off left entry 7, about 2,500 feet approximately northeast of drift mouth.

Section C (sample 8083) was cut from room 10, off left entry 4, about 1,700 feet approximately northeast of drift mouth.

Section D (sample 8245) was cut from room 4, off left entry 9, off new main entry, approximately 3,300 feet east of drift mouth.

Section E (sample 8691) was cut from room 12, off left entry 4.

A composite sample was made by mixing samples 8081, 8082, 8083, and 8245 for an ultimate analysis, the results of which are shown under laboratory No. 8162.

Notes.—The coal was mined both by hand and with chain machines in the upper part of the bed, and was shot down with black powder and a short-flame explosive. The tipple also served the Sidney mine in the hill opposite. It was not, at time of sampling and inspection in 1909, equipped with screens, but bar screens with 5-inch and 2-inch spaces were to be installed shortly. The coal was picked on the car. The daily output of the Oswald mine averaged about 600 tons, and the capacity was 700 tons. The future output was to be derived chiefly from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 287.

PRICE HILL. PRICE HILL MINE

Sample.—Semibituminous coal; New River field; analyses Nos. 7931, 7932, 8127, 8689, 8690, 8188 (p. 287).

Mine.—Price Hill; Kanawha-New River district; a shaft mine, 120 feet in depth, at Price Hill, 2 miles southwest of Macdonald, on the White Oak Railway, connecting with the Loup Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. Thickness, nearly uniform (except where there are rolls), ranging, as mined, from about 3 feet 8 inches to 4 feet 6 inches; roof, sandstone, underlain locally with shale; floor, rather soft shaly underclay.

The bed was measured and sampled at two points on June 14, 1909, and at one point on July 8, 1909, by F. J. Simington, and at two points on August 5, 1909, by A. J. Hazlewood, as described below:

Sections of coal bed in Price Hill mine at Price Hill.

Section	A		B		C		D		E	
Laboratory No	7931		7932		8127		8689		8690	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	..	..	[a] 0	3	..	..	..	..	..	..
Coal	0	3	1	2	..	..	0	7½	..	..
Sulphurous coal	0	⅛	..	..	..	..	[a] 0	4½	..	..
Coal	0	3	..	..	..	..	..	..	..	..
Pyrite	0	¼	..	..	..	..	..	..	..	..
Coal	1	3	..	..	1	6	0	6	1	6½
Hard gray coal	0	4	0	1¾	0	2	1	2	1	4
Coal (in some places mother-coal streaks)	1	11	2	4	2	9	1	5	0	10
Floor, soft shaly underclay.										
Thickness of bed	4	⅜	3	10¾	4	5	4	1	3	8½
Thickness of coal sampled	4	⅜	3	7¾	4	5	3	8½	3	8½

[a] Not included in sample.

Section A (sample 7931) was cut from face of main entry, about 2,600 feet southwest of shaft.

Section B (sample 7932) was cut from room 8, off right entry 8, about 1,200 feet northwest of shaft.

Section C (sample 8127) was cut from room 19, off left entry 2, about 2,300 feet south of shaft.

Section D (sample 8689) was cut from room 19, off left air course 2, about 2,500 feet south of shaft.

Section E (sample 8690) was cut from face of left entry 4, about 3,000 feet from shaft.

A composite sample was made by mixing samples 7931, 7932, and 8127 for an ultimate analysis, the results of which are shown under laboratory No. 8188.

Notes.—The coal was undercut in bottom part of bed, usually by hand, but punching and chain machines were used to some extent. The tipple was not equipped with screens, the entire output being shipped as run-of-mine coal. The estimated daily output at time of sampling and measurement was about 500 tons, and 1,000 tons was the capacity of the mine.

For chemical analyses of this coal see part 1 of this bulletin, p. 287.

RALEIGH. RALEIGH NO. 6 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8263, 8264, 8265, 8266, 8309 (pp. 287, 288).

Mine.—Raleigh No. 6; Kanawha-New River district; a drift mine, near Raleigh, on the Piney Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Thickness, fairly uniform, averaging about 4¾ feet; main roof, shale of good quality, between which and the coal is from 3 to 10 inches of "draw slate" which tended to mix with the coal; floor, soft shale with a smooth surface.

The bed was measured and sampled at four points by A. J. Hazlewood on July 12, 1909, as described below:

Sections of coal bed in Raleigh No. 6 mine near Raleigh.

Section	A		B		C		D	
Laboratory No.	8264		8265		8263		8266	
Roof, shale and "draw slate."	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal, soft	2	10	4	3½	..	..	2	7¼
Hard bony coal	[a]0	1½	..	..	[a]0	2	0	2
Coal, soft	2	4	..	..	1	2	1	3
Coal, hard	..	..	..	..	1	4¼	0	11¼
Coal, soft	..	..	..	..	1	6	..	..
Floor, soft clay, smooth surface.								
Thickness of bed	5	3½	4	3½	4	2¼	4	11½
Thickness of coal sampled	5	2	4	3½	4	¼	4	11½

[a] Not included in sample.

Section A (sample 8264) was cut from the face of west parallel entry 1, 1,400 feet from drift mouth.

Section B (sample 8265) was cut from the face of main south entry 1, 2,100 feet from drift mouth.

Section C (sample 8263) was cut from the face of left entry 4, 1,800 feet from drift mouth.

Section D (sample 8266) was cut from the face of south entry 4.

A composite sample was made by mixing samples 8263, 8264, 8265, and 8266 for an ultimate analysis, the results of which are shown under laboratory No. 8309.

Notes.—The coal at this mine was undercut with chain machines and was shot down with a permissible explosive. No screening was done, the coal being shipped in run-of-mine form. The average daily output at the time of sampling in 1909 was 600 tons, and 800 tons was a maximum day's run. The future output was to be derived from advance workings, and the tonnage was to be increased.

For chemical analyses of this coal see part I of this bulletin, pp. 287, 288.

RALEIGH. RALEIGH NO. 1 AND NO. 2 MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8252, 8253, 8254, 8255, 8306, 8307 (p. 288).

Mines.—Raleigh No. 1 and No. 2; Kanawha-New River district; drift mines, at Raleigh, on the Piney Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Thickness, fairly uniform, ranging as mined from 4¾ to 5 feet; main roof, blue argillaceous shale with smooth surface; floor, shale which is rather soft.

The bed was measured and sampled at two points in Raleigh No. 1 mine and at two points in Raleigh No. 2 mine by C. A. Fisher on July 6, 1909, as described below:

Sections of coal bed in Raleigh No. 1 mine at Raleigh.

Section	A		B	
Laboratory No.	8252		8253	
Roof, sandstone and blue argillaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	1½	0	2
Coal	4	7	4	10
Floor, soft shale.				
Thickness of bed	4	8½	5	0
Thickness of coal sampled	4	7	4	10

[a] Not included in sample.

Section A (sample 8252) was cut from the face of right haulway 4.

Section B (sample 8253) was cut from the face of right haulway 7, in room 1.

A composite sample was made by mixing face samples 8252 and 8253 for an ultimate analysis, the results of which are shown under laboratory No. 8306.

Sections of coal bed in Raleigh No. 2 mine at Raleigh.

Section	A		B	
Laboratory No	8254		8255	
Roof, sandstone and blue argillaceous shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	2	0	1
Coal	5	2	3	11
Floor, soft shale.				
Thickness of bed	5	4	4	0
Thickness of coal sampled	5	2	3	11

[a] Not included in sample.

Section A (sample 8254) was cut from a pillar in right entry 2.

Section B (sample 8255) was cut from room 18, off right entry 1.

A composite sample was made by mixing samples 8254 and 8255 for an ultimate analysis, the results of which are shown under laboratory No. 8307.

Notes.—The coal at this mine was mined by hand at the top of the bed. There were no screens at the mine, all of the coal being shipped in run-of-mine form. The daily output of the mine at time of sampling in 1909 averaged 1,000 tons, and 1,150 tons was a maximum day's run. The output for some time was expected to come from advance workings, the tonnage remaining about the same.

For chemical analyses of this coal see part I of this bulletin, p. 288.

RALEIGH. RALEIGH NO. 3 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8256, 8257, 8258, 8308 (pp. 288, 289).

Mine.—Raleigh No. 3; Kanawha-New River district; a drift mine at Raleigh, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Average thickness, about 4½ feet; roof, hard shale the lower 2 inches of which came down in places as a "draw slate"; floor, soft underclay, some of which in parts of the mine got mixed with the coal in mining.

The bed was measured and sampled at three points by A. J. Hazlewood on July 6, 1909, as described below:

Section A (sample 8257) was taken from a 3-foot 10-inch cut of coal. It was cut from the face of right entry 14, 5,000 feet from the drift mouth.

Section B (sample 8258) was taken from a 5-foot 4-inch cut of coal. It was cut from the face of left entry 7, 4,200 feet from the drift mouth.

Section C (sample 8256) was taken from a 4-foot 5-inch cut of coal. It was cut from the face of new right entry 6, 1,800 feet from the drift mouth.

A composite sample was made by mixing the face samples 8256, 8257, and 8258 for an ultimate analysis, the results of which are shown under laboratory No. 8308.

Notes.—The coal at this mine was undercut in bottom part of the bed with chain machines and was shot down with a permissible explosive. The loading house had bar screens of 1-inch and 3-inch spaces. The output of the mine at the time of sampling was 750 tons daily, run-of-mine coal; the capacity was 1,100 tons, and a maximum day's run was 1,400 tons. The mine had 1,500 acres of coal, and the expectation was that tonnage would gradually increase and be derived from advance work for a number of years.

For chemical analyses of this coal see part I of this bulletin, pp. 288, 289.

RALEIGH. BLUE JAY MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8272, 8273, 8274, 8312 (p. 289).

Mine.—Blue Jay; Kanawha-New River district; a drift mine near Blue Jay, 1 mile from Raleigh, on the Piney Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Average thickness, as mined, 5 feet; main roof, soft blue shale, some of which in places got mixed with the coal in loading; floor, soft clay with smooth surface.

The bed was measured and sampled at three points by A. J. Hazlewood on July 8, 1909, as described below:

Sections of coal bed in Blue Jay mine, 1 mile from Raleigh.

Section	A		B		C	
Laboratory No	8274		8272		8273	
Roof, soft, blue shale	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (soft, fragile)	1	3½	1	4⅛	1	4⅛
Bony coal [a]	0	3½	0	11	0	11
Coal (soft, fragile)	3	1	3	5⅛	3	5⅛
Floor, soft clay, smooth surface.						
Thickness of bed	4	8	5	8¼	5	8¼
Thickness of coal sampled	4	4½	4	9¼	4	9¼

[a] Not included in sample.

Section A (sample 8274) was cut from the face of right entry 1, 500 feet from drift mouth.

Section B (sample 8272) was cut from the face of the main entry, 600 feet from drift mouth.

Section C (sample 8273) was cut from the face of the main entry, 600 feet southeast of drift mouth.

A composite sample was made by mixing samples 8272, 8273, and 8274 for an ultimate analysis, the results of which are shown under laboratory No. 8312.

Notes.—The coal at this mine was mined by hand at top of bed, and was shot down with a permissible explosive. The coal was shipped in run-of-mine form. The daily output was 300 tons, and 400 tons was a maximum day's run. The output was to be derived mainly from advance workings, and the tonnage was to be increased.

For chemical analyses of this coal see part I of this bulletin, p. 289.

SLAB FORK. SLAB FORK NO. 1, NO. 2, AND NO. 3 MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8337, 8338, 8339, 8373, 8371, 8372, 8459, 8460 (p. 289).

Mines.—Slab Fork No. 1, No. 2, and No. 3; Kanawha-New River district; drift mines at Slab Fork, on the Virginian Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Thickness of coal, as mined, from about 3 feet 7 inches to 5 feet 10 inches; roof, sandstone underlain with a gray shale (usually less than 1 foot in thickness) between which and the coal there is in places a few inches of "draw slate;" floor, smooth shaly underclay (fairly hard).

The bed was measured and sampled at two points in the No. 1 opening, and at one point in the No. 3 opening by J. W. Groves on July 20, 1909, and at three points in the No. 2 opening by A. J. Hazlewood on July 20, 1909, as described below:

Sections of coal bed in Slab Fork No. 1 mine at Slab Fork.

Section	A		B	
Laboratory No.	8371		8372	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal [a]	0	3½	..	..
Coal	2	6¼	1	1¼
Mother coal (in places shale)	0	½	0	¼
Coal	2	0	3	½
Bony coal	..	..	0	1
Sulphur [a]	0	1	..	..
Coal	0	10¼	0	7
Floor, gray shaly underclay.				
Thickness of bed	5	9½	4	10
Thickness of coal sampled	5	5	4	10

[a] Not included in sample.

Section A (sample 8371) was cut from a room off the main air course, about 1,800 feet northwest of drift mouth.

Section B (sample 8372) was cut from room 4, about 500 feet west of drift mouth.

A composite sample was made by mixing samples 8371 and 8372 for an ultimate analysis, the results of which are shown under laboratory No. 8459.

Sections of coal bed in Slab Fork No. 2 mine at Slab Fork.

Section	D		E		F	
Laboratory No.	8337		8338		8339	
Roof: Section D, sandstone; section E, "draw slate;" section F, shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal (clean)	..	..	..	..	[a] 0	2½
Shale	..	..	..	..	[a] 0	2
Coal	3	7½	5	3⅝	4	1¼
Floor, smooth shaly underclay.						
Thickness of bed	3	7½	5	3⅝	4	5¾
Thickness of coal sampled	3	7½	5	3⅝	4	1¼

[a] Not included in sample.

Section D (sample 8337) was cut from face of right entry 1.

Section E (sample 8338) was cut from face of left entry 2.

Section F (sample 8339) was cut from face of main entry, about 1,400 feet from drift mouth.

A composite sample was made by mixing samples 8337, 8338, and 8339 for an ultimate analysis, the results of which are shown under laboratory No. 8460.

Section of coal bed in Slab Fork No. 3 mine at Slab Fork.

Section	C	
Laboratory No.	8373	
Roof, gray shale.	*Ft.*	*in.*
Coal	0	1
Mother coal	0	½
Coal	2	5
Mother coal	0	¼
Coal	0	8
Bone	0	1¼
Coal	0	11
Floor, gray shaly underclay.		
Thickness of coal	4	3
Thickness of coal sampled	4	3

Section C (sample 8373) was cut from main entry, about 600 feet east of drift mouth.

Notes.—The coal was undercut in bottom part of bed with chain machines, and was shot down with a permissible explosive. The Slab Fork mines at time of sampling consisted of five drift openings each called a mine, which supplied coal to one tipple. Four of the drifts were being worked and all were probably to be connected underground. The tipple had bar screens, with 1-inch openings, but the entire output was shipped as run-of-mine coal. The daily output averaged about 750 tons, and 850 tons was a maximum day's run. The mines were new, and the production was to be steadily increased. The output was to be derived chiefly from advance work for some years.

For chemical analyses of this coal see part I of this bulletin, p. 289.

SOPHIA. WOOD MINE.

Sample.—Semibituminous coal; New River field; analysis No. 8906 (p. 289).

Mine.—Wood; Kanawha-New River district; a drift mine near Sophia (no railroad connections) on Winding Gulf Creek.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. It is about 4 feet 10 inches in thickness; has a shale roof and hard underclay floor.

The bed was measured and sampled at one point by A. J. Hazlewood on August 14, 1909, as described below:

Section of coal bed in Wood mine, near Sophia.

Section	A	
Laboratory No	8906	
	Ft.	*in.*
Roof, sandstone and hard and soft "draw slate."		
Coal [a]	0	1
Clay [a]	0	½
Coal (fragile)	0	9½
Coal (hard)	1	3½
Coal	1	1½
Bony coal	0	5
Coal	1	3
Floor, carbonaceous shale and hard underclay.		
Thickness of bed	5	0
Thickness of coal sampled	4	10½

[a] Not included in sample.

Section A (sample 8906) was cut from the face of the main entry, 96 feet from the drift mouth.

Notes.—The coal was undercut with picks and shot down with black powder. This mine was a single drift driven about 100 feet and the coal was used in driving a railroad tunnel. The sample was taken in order to ascertain the character of this coal, since several mines were soon to be opened on Winding Gulf Creek on the Beckley bed.

For chemical analyses of this coal see part I of this bulletin, p. 289.

SOPHIA. COMPRESSOR MINE.

Sample.—Semibituminous coal; New River field; analysis No. 8907 (p. 289).

Mine.—Compressor; Kanawha-New River district; a drift mine 1 mile up Winding Gulf from Sophia post office (not on a railroad).

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. The thickness of the coal is 5 feet 5 inches; has a shale roof and floor of hard underclay.

The bed was measured and sampled at one point by A. J. Hazlewood in August, 1909, as described below:

Section of coal bed in Compressor mine, 1 mile from Sophia.

Laboratory No.	8907	
	Ft.	*in.*
Roof, hard shale.		
Coal	1	3¼
Coal (hard)	1	0
Coal	1	5
Bony coal[a]	0	3½
Coal	1	6
Floor, hard underclay.		
Thickness of bed	5	5¾
Thickness of coal sampled	5	2¼

[a] Not included in sample.

Section A (sample 8907) was cut from the face of the main entry, 200 feet from drift mouth.

Notes.—This sample was taken from a drift which had been opened to procure coal for an air-compressor plant in driving a railroad tunnel. The sample was taken because several mines were soon to be opened on Winding Gulf Creek on the Beckley bed of coal.

For chemical analyses of this coal see part I of this bulletin, p. 289.

STANAFORD. PINEY NO. 1 MINE (NO. 6 DRIFT).

Sample.—Semibituminous coal; New River field; (Jamestown No. 10) analyses Nos. 5502, 5503 (p. 289).

Mine.—Piney No. 1, No. 6 drift; Kanawha-New River district; a drift mine at Stanaford, on the Chesapeake & Ohio Railway.

Coal bed.—Beckley. It is of Carboniferous age, Quinnimont formation. At this mine the bed lies nearly flat and is of fairly uniform thickness, averaging about 6 feet. The roof and floor are of shale. The coal carries irregular partings of bony coal, or shale, and sulphur.

The bed was measured and sampled at two points in the mine by K. M. Way on October 16, 1907, as shown below:

Sections of coal bed in Piney No. 1 mine, No. 6 drift, at Stanaford.

Section	A		B	
Laboratory No.	5502		5503	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	1	5¼	0	4
Bone and shale[a]	0	11¼	..	..
Sulphur[a]	..	..	0	¾
Coal	0	2¾	0	5¼
Sulphur[a]	0	½	..	..
Mother coal	..	..	0	¼
Coal	1	11¾	0	4¼
Mother coal	0	¼	..	..
Bone and shale[a]	..	..	0	10¼
Coal	1	9	0	9
Sulphur	..	..	0	½
Coal	..	..	2	6½
Floor, shale.				
Thickness of bed	6	4¾	5	4¾
Thickness of coal sampled	5	5	4	5¾

[a] Not included in sample.

Section A (sample 5502) was measured in the face of left entry 2, 2,700 feet southwest of the drift mouth.

Section B (sample 5503) was measured in the face of right entry 2, 2,700 feet west of the drift mouth.

Notes.—The coal from this mine, like that from other mines in the district, was used for steam production by railroads and manufacturing plants and also for domestic purposes. The output, which in 1907 was about 300 tons per day, was shipped by water to points on the Ohio and Mississippi Rivers and by rail and water to points on the Atlantic seaboard.

For results of briquetting tests of this coal see U. S. Geol. Survey Bull. 385, p. 26; also Bureau of Mines Bull. 33, p. 17.

For chemical analyses see part I of this bulletin, p. 289; also U. S. Geol. Survey Bull. 362, p. 18.

STANAFORD. STANAFORD NO. 1 AND NO. 2 MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8267, 8268, 8269, 8311, 8270, 8271 (p. 290).

Mines.—Stanaford No. 1 and No. 2; Kanawha-New River district; drift mines near Stanaford, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. The thickness of the coal averages 6 feet in No. 1 mine and 5½ feet in No. 2 mine. The roof is a shale of good quality with a thickness of 18 feet. Six to 10 inches of it came down in No. 1 mine as "draw slate," parts of which got mixed with the coal in loading. The floor is a shale with a slightly rough surface, but little of the shale got mixed with the coal.

The bed was measured and sampled at three points in No. 1 mine and at two points in No. 2 mine by A. J. Hazlewood on July 13, 14, and 15, 1909, as described below:

Sections of coal bed in Stanaford No. 1 mine near Stanaford.

Section	A		B		C	
Laboratory No	8267		8268		8269	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale and "draw slate."						
Coal, soft, clean	..	..	0	9	..	..
Coal, bony	..	..	0	9	..	..
Coal, soft	..	..	2	4	..	..
Coal, firm	6	11	..	..	6	11
Floor, hard, curly shale.						
Thickness of bed	6	11	3	10	6	11
Thickness of coal sampled	6	11	3	10	6	11

Section A (sample 8267) was cut from the face of main entry, 3,900 feet from drift mouth.

Section B (sample 8268) was cut from the face of left entry 2.

Section C (sample 8269) was cut from the face of main entry, 3,900 feet southwest of drift mouth.

A composite sample was made by mixing samples 8267, 8268, and 8269 for an ultimate analysis, the results of which are shown under laboratory No. 8311.

Sections of coal bed in Stanaford No. 2 mine near Stanaford.

Section	A		B	
Laboratory No	8270		8271	
	Ft.	*in.*	*Ft.*	*in.*
Roof, hard shale.				
Coal (poor, partly bone) [a]	1	6½	..	..
Bony coal [a]	1	10½	..	..
Coal	3	3	4	2⅛
Floor, hard, curly shale.				
Thickness of bed	6	8	4	2⅛
Thickness of coal sampled	3	3	4	2⅛

[a] Not included in sample.

Section A (sample 8270) was cut from the face of main entry, 1,000 feet southwest of the drift mouth.

Section B (sample 8271) was cut from the face of main entry, 2,900 feet southwest of the drift mouth.

A composite sample for this mine was not made, but an ultimate analysis is given on sample 8270.

Notes.—The coal at these two mines was undercut by hand, and was shot down with a permissible explosive. There was a common tipple for the two mines, but no screens, the total output being shipped as run-of-mine coal.

The daily output of No. 1 and No. 2 mines at time of sampling in 1909 was 750 tons, and 850 tons was a maximum day's run. These mines were comparatively new and the future output for many years was to be derived chiefly from advance workings.

For chemical analyses of this coal see part I of this bulletin, p. 290.

STANAFORD. STANAFORD (PINEY) NO. 3 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8275, 8276, 8277, 8313 (pp. 290, 291).

Mine.—Stanaford (Piney) No. 3; Kanawha-New River district; a drift mine, 1½ miles from Stanaford (Riley P. O.), on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Sewell. Carboniferous age, Sewell formation. The thickness of the coal as mined averages 4½ feet. The roof is a hard sandstone, between which and the coal occurs 4 to 8 inches of "draw slate," some of which in places got mixed with the coal in mining. The floor is a soft shale with a smooth surface.

The bed was measured and sampled at three points by A. J. Hazlewood on July 14, 1909.

Section A (sample 8275) was taken from a 4-foot 3½-inch cut of coal. It was cut from the face of left entry 6, 2,070 feet northwest of drift mouth.

Section B (sample 8276) was taken from a 4-foot 2⅝-inch cut of coal. It was cut from the face of right entry 7, 2,160 feet northwest of drift mouth.

Section C (sample 8277) was taken from a 3-foot 5½-inch cut of coal. It was cut from the face of main entry, 3,200 feet northwest of drift mouth.

A composite sample was made by mixing samples 8275, 8276, and 8277 for an ultimate analysis, the results of which are shown under laboratory No. 8313.

Notes.—The coal at the mine was undercut by hand, and was shot down with permissible explosives. The coal was lowered to the No. 4 tipple, which was not equipped with screens. The coal was shipped in run-of-mine form. The daily average output in 1909 at time of sampling was 300 tons, and a maximum day's run was 500 tons. There were approximately 1,200 acres of unmined coal to be taken out through the opening.

For chemical analyses of this coal see part I of this bulletin, pp. 290, 291.

STANAFORD. STANAFORD (PINEY) NO. 4 MINE.

Sample.—Semibituminous coal; New River field; analysis No. 8278 (p. 291).

Mine.—Stanaford (Piney) No. 4 mine; Kanawha-New River district; a drift mine, 1½ miles south of Stanaford, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. The thickness of the coal as mined averages about 4 feet. The impurities consist of occasional "sulphur" balls. The roof is a hard sandstone. The floor is a soft shale with a slightly rough surface, but little of the shale got mixed with the coal.

The bed was measured and sampled at one point by A. J. Hazlewood on July 13, 1909. The sample (No. 8278) was taken from a 4-foot 1-inch cut of coal. It was cut from the face of main entry, 1,600 feet southwest of drift mouth.

An ultimate analysis was made on sample 8278 which is reported under the same number.

Notes.—The coal was undercut by hand, and was shot down with permissible explosives. The tipple had no screens. The average daily output at time of sampling was 350 tons, and 400 tons was a maximum day's run. The future output was to be derived from advance workings. The unmined area of No. 1, No. 2, and No. 4 mines approximated 6,400 acres.

For chemical analyses of this coal see part I of this bulletin, p. 291.

STONEWALL. STONEWALL NO. 2 MINE.

Sample.—Semibituminous coal; New River field; analysis No. 8345 (p. 291).

Mine.—Stonewall No. 2; Kanawha-New River district; a drift mine at Stonewall, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. The coal varies in thickness from 2 to 3 feet. It has a gray shale roof, which, for the greater portion of the mine, is good. The floor is a gray underclay.

The bed was measured and sampled at one point by J. W. Groves on July 19, 1909.

The section (sample 8345) was taken from a 2-foot 10-inch cut of coal. It was cut from face of left entry 1, 500 feet north of drift mouth.

Notes.—The coal was undercut with hand picks, and was shot down with a permissible explosive. The tipple had bar screens, and could load dump, slack, and run-of-mine coal. The coal was practically all shipped in run-of-mine form. The average daily output in 1909, at time of sampling, was 40 tons, but should be considered in connection with that of the Stonewall No. 3 mine, because the output of the two mines was mixed before shipment.

For chemical analyses of this coal see part I of this bulletin, p. 291.

STONEWALL. STONEWALL NO. 3 MINE.

Sample.—Semibituminous coal; New River field; analyses Nos. 8343, 8344, 8341, 8342, 8426 (p. 291).

Mine.—Stonewall No. 3; Kanawha-New River district; a drift mine 1½ miles west of Stonewall Station, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. It varies in thickness from 4 feet to 5 feet 2 inches; the roof is a gray shale, which disintegrates upon exposure to air and moisture. Immediately above the coal there was in a part of the mine a clay band about 2 inches thick, which came down with the coal and some of it got in the loaded coal. The floor is a hard underclay with a fairly smooth surface. The cover over the mine is from 30 to 200 feet.

The bed was measured and sampled at four places by J. W. Groves on July 16, 1909, as described below:

Sections of coal bed in Stonewall No. 3 mine, 1½ miles west of Stonewall Station.

Section	A		B		C		D	
Laboratory No.	8343		8344		8341		8342	
Roof, soft gray shale and clay.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	3	5	3	9¼	4	9½	0	4½
Mother coal	0	¼	0	1	..	..	..	..
Bony coal [a]	..	..	..	..	..	..	0	1½
Coal	1	3¼	0	10¼	..	..	4	7¾
Floor, hard underclay.								
Thickness of bed	4	8½	4	8½	4	9½	5	1¾
Thickness of coal sampled	4	8½	4	8½	4	9½	5	¼

[a] Not included in sample.

Section A (sample 8343) was cut from room 3 on entry 34, 2,700 feet west of the drift mouth.

Section B (sample 8344) was cut from room 9 on entry 32, 2,300 feet southwest of the drift mouth.

Section C (sample 8341) was cut from a pillar in entry 29½, 2,000 feet west of the drift mouth.

Section D (sample 8342) was cut from the face of entry 24, 1,700 feet west of the drift mouth.

A composite sample was made by mixing the face samples 8342, 8343, and 8344 for an ultimate analysis, the results of which are shown under laboratory No. 8426.

Notes.—The coal at this mine was undercut with hand picks in bottom part of bed, and was shot down with a permissible explosive. The railroad tipple had bar screens, and could load lump, slack, and run-of-mine coal. The coal was practically all shipped in run-of-mine form. The daily output at time of sampling in 1909 was 250 tons, the mine having a capacity of 350 tons. The future output of this mine was to be practically all derived from pillar coal. This output, however, should be considered in connection with that of the Stonewall No. 2 mine, since the output of the two mines was mixed before it was loaded on the cars.

For chemical analyses of this coal see part I of this bulletin, p. 291.

SULLIVAN. SULLIVAN MINES.

Sample.—Semibituminous coal; New River field; analyses Nos. 8282, 8283, 8409 (p. 291).

Mines.—Sullivan; Kanawha-New River district; drift mines, at Sullivan, on a stub from the Piney Creek branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Beckley. Carboniferous age, Quinnimont formation. Thickness, uniform, ranging as mined from 4 feet 1¼ inches to 4 feet 10½ inches; roof, strong shale which did not fall with the coal; floor, hard, slaty underclay with smooth surface and underlain 10 feet below with sandstone.

The bed was measured and sampled at two points by A. J. Hazlewood on July 10, 1909, as described below:

Sections of coal bed in Sullivan mines at Sullivan.

Laboratory No.	8282		8283	
	Ft.	*in.*	*Ft.*	*in.*
Roof, hard shale.				
Coal	2	11¼	4	5½
Hard mother coal	0	1	..	..
Fragile coal	0	8½	..	..
Sulphur	0	1	0	1
Coal	0	3½	0	4
Floor, hard, slaty underclay.				
Thickness of bed	4	1¼	4	10½
Thickness of coal sampled	4	1¼	4	10½

Sample 8282 was cut from the face of the main south entry, 320 feet from drift mouth of the south mine.

Sample 8283 was cut from the face of main entry 2, 200 feet from drift mouth of the north mine.

A composite sample was made by mixing samples 8282 and 8283 for an ultimate analysis, the results of which are shown under laboratory No. 8409.

Notes.—The coal from these mines was undercut in bottom part of bed by hand, and was shot down with a short-flame explosive or black powder. The tipple had no screens, so that the entire output was shipped as run-of-mine coal. The daily output at time of sampling in 1909 averaged 500 tons. These were practically new mines and the output was to be increased gradually. The output for some time was to be derived entirely from advance work.

For chemical analyses of this coal see part I of this bulletin, p. 291.

TERRY. TERRY MINE.

Sample.—Bituminous coal; New River field; analyses Nos. 8353, 8354, 8355, 8423 (p. 291).

Mine.—Terry; Kanawha-New River district; a drift mine at Terry, on the Piney Creek Branch of the Chesapeake & Ohio Railway.

Coal bed.—Known in this field as the Fire Creek. Carboniferous age, Quinnimont formation. The coal varies considerably in thickness, ranging from 2 to 5 feet. The roof is fairly good in places and in others is rather bad, being a "slippy" shale. Some of it fell and got mixed with the coal in mining. The floor is a gray underclay, which in general presents a fairly good surface for shoveling.

The bed was measured and sampled at three points by J. W. Groves on July 15, 1909, as described below:

Sections of coal bed in Terry mine at Terry.

Section	A		B		C	
Laboratory No	8353		8354		8355	
Roof, gray shale (soft).	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	4	2	..	..	2	5½
Mother coal	0	¼	..	..	0	¼
Coal	0	5½	..	..	0	7¼
Mother coal	0	½	..	..	..	..
Coal	0	3	0	5¼	..	..
Gray band [a]	..	..	0	3	..	..
Coal	..	..	1	4½	..	..
Bony coal [a]	..	..	0	6	..	..
Floor, hard underclay.						
Thickness of bed	4	11¼	2	6¾	3	1
Thickness of coal sampled	4	11¼	1	9¾	3	1

[a] Not included in sample.

Sample A (sample 8353) was cut from the face of room 11, off right entry 2, 2,200 feet north from the drift mouth.

Section B (sample 8354) was cut from the face of main entry 2, 2,000 feet west of the drift mouth.

Section C (sample 8355) was cut from the face of left entry 1, in room 3, 1,000 feet south of the drift mouth.

A composite sample was made by mixing the face samples 8353, 8354, and 8355 for an ultimate analysis, the results of which are shown under laboratory No. 8423.

Notes.—The coal at this mine was undercut with picks and shot down with black powder. The tipple was equipped with bar screens with 2-inch spaces. It was capable of loading lump, screenings, and run-of-mine coal, and had a storage-bin capacity of 100 tons. The coal was cleaned by two pickers as it was loaded on the railroad cars. The daily output of the mines at the time of sampling in 1909 was 350 tons, derived largely from pillars.

For chemical analyses of this coal see part I of this bulletin, p. 291.

WEST RALEIGH. RALEIGH NO. 1 AND NO. 2 MINES.

Sample.—Semibituminous coal; New River field; (Jamestown No. 11) analyses Nos. 5547, 5548 (p. 291).

Mines.—Raleigh No. 1 and No. 2; Kanawha-New River district; drift mines at West Raleigh, on the Chesapeake & Ohio Railway.

Coal bed.—The Beckley of the West Virginia Geological Survey. It is of Carboniferous age, Quinnimont formation. At these mines, the bed lies nearly flat, and is rather uniform in thickness, averaging about 5 feet. The bed carries a few regular streaks of bony coal and shale.

The bed was measured and sampled at two points in the mines by K. M. Way on October 22, 1907, as shown below:

Sections of coal bed in West Raleigh No. 1 and No. 2 mines at West Raleigh.

Section	A		B	
Laboratory No.	5547		5548	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Bony coal and shale [a]	0	2¾	0	1½
Coal	3	0	1	4½
Bony coal	0	¾	..	..
Sulphur	..	..	0	¼
Coal	0	11¼	1	7½
Mother coal	0	½	..	..
Bony coal	..	..	0	¼
Coal	0	1	0	5¾
Mother coal	0	¼	0	⅛
Coal	0	3	0	2½
Mother coal	..	..	0	¼
Coal	..	..	0	11½
Floor, shale.				
Thickness of bed	4	7½	4	10⅛
Thickness of coal sampled	4	4¾	4	8⅝

[a] Not included in sample.

Section A (sample 5547) was measured in a pillar between right entries 5 and 5½ in No. 2 mine, 1,800 feet northeast of the drift mouth.

Section B (sample 5548) was measured in the face of right entry 7 in No. 1 mine, 3,150 feet northwest of the drift mouth.

Notes.—The coal from these mines, like that from other mines in this district, is friable, and was used for steam production. It was shipped in run-of-mine form. The average daily output in 1907 was about 700 tons per day. A small quantity of slack was made into coke in beehive ovens at the mine.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 403, p. 17; briquetting tests: U. S. Geol. Survey Bull 385, p. 27.

For chemical analyses of this coal see part I of this bulletin, p. 291; also U. S. Geol. Survey Bull 362, p. 19.

RANDOLPH COUNTY.

COALTON. COALTON MINE.

Sample.—Bituminous coal: Tygart River field; (West Virginia No. 5) analyses Nos. 1144, 1147 (p. 292).

Mine.—Coalton; Kanawha-New River district; a drift mine at Coalton, on the Coal & Coke Railroad.

Coal bed.—"Lower Kittanning," locally known as the Roaring Creek. It is of Carboniferous age, Allegheny (?) formation. The bed lies nearly flat and is worked by a drift from the outcrop. The bed contains several partings, but by boring in just above the lower shale, and by shooting the bottom and the top, it is possible to obtain the entire face of good coal.

Two sections were measured and sampled in the mine by J. S. Burrows in 1904, as shown below:

Sections of coal bed in Coalton mine at Coalton.

Section	A		B	
Laboratory No.	1144		1147	
	Ft.	*in.*	*Ft.*	*in.*
Bone [a]	0	4–6	0	4–6
Coal	2	0	1	6½
Shale [a]	0	¼	0	2¼
Coal	3	4	3	3½
Shale [a]	0	3½	0	2¾
Coal	1	5	1	7
Thickness of bed	7	5¾	7	3
Thickness of coal sampled	6	9	6	5

[a] Not included in sample.

Section A (sample 1144) was measured at the face of right heading 5.

Section B (sample 1147) was measured at the face of left heading 6.

Notes.—The rated capacity of the mine in 1904 was 1,500 tons per day. Most of the product was shipped to Eastern cities for steam production. Nearly all the slack separated from the coal was made into coke at the mine.

For results of tests of this coal see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 849; Bull. 261, p. 82; washing tests: U. S. Geol. Survey Prof. Paper 48, p. 1472; Bull. 261, p. 72; coking tests: U. S. Geol. Survey Prof. Paper 48, p. 1358; Bull. 261, p. 127; cupola tests of coke: U. S. Geol. Survey Prof. Paper 48, pp. 1379, 1380.

For chemical analyses see part I of this bulletin, p. 292; also U. S. Geol. Survey Prof. Paper 48, p. 252; Bull. 261, p. 55.

TUCKER COUNTY.

THOMAS. THOMAS NO. 23 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 393, 394, 395, 396, 397, 10450 (pp. 292, 293).

Mine.—Thomas No. 23; Potomac district; a drift mine at Thomas, on the Western Maryland Railroad and the Baltimore & Ohio Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny series. The bed as mined has an average thickness of 5 feet 9 inches, varying from 4½ to 7 feet. The roof is a shale of good quality. The floor is a hard shale which did not get mixed with the coal in mining.

The bed was measured and sampled at five points by P. M. Riefkin on April 19, 1910, as described below:

Sections of coal bed in Thomas No. 23 mine at Thomas.

Section	A		B		C		D		E	
Laboratory No.	393		394		395		396		397	
Roof, shale:	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bony coal	[a] 0	7½	[a] 0	1½	[a] 0	2½	[a] 0	2	[a] 0	2
Coal	0	4	0	1	0	4½	1	0	..	..
Shale	0	1/16	0	1/16	..	..	..	..	..	..
Coal	0	3	0	7	..	..	0	4½	0	10
Bony coal	[a] 0	¾	[a] 0	9½	[a] 0	2⅜	[a] 1	8	[a] 0	8½
Coal	0	1¼	0	7	0	2	0	3¼	0	4¼
Bone and slate	[a] 0	2	[a] 0	10½	[a] 1	1	0	1¼	[a] 1	2¾
Coal	[a] 0	6¾	0	4½	1	5	0	7½	0	4⅜
Coal (gray)	0	4⅞	[a] 0	8¾	0	4	0	1¼	0	4
Coal (bright)	1	¾	1	3⅝	0	3½	1	8¾	1	6¾
Mother coal	0	⅛	0	2	..	..	0	⅛	0	1/16
Coal	0	9½	1	7¾	0	5½	1	½	1	3
Floor, hard shale.										
Thickness of bed	4	4 9/16	7	3 3/16	4	6⅜	7	1⅛	6	9 11/16
Thickness of coal sampled	2	11 9/16	4	8 15/16	3	½	5	3⅛	4	8 7/16

[a] Not included in sample.

Section A (sample 393) was cut from last crosscut, near face of Pendleton heading, 2,000 feet from drift mouth.

Section B (sample 394) was cut from Thomas air course, near the face of Huber air course, 8,600 feet northeast of drift mouth.

Section C (sample 395) was cut from face of Layman heading, 7,800 feet northeast of drift mouth.

Section D (sample 396) was cut from face of dip 5, 6,800 feet northwest of drift mouth.

Section E (sample 397) was cut from face of butt entry 8.

A composite sample was made by mixing samples 393, 394, 395, 396, and 397 for an ultimate analysis, the results of which are shown under laboaratory No. 10450.

Notes.—The coal was cut in bottom part of the bed with electric coal-cutting machines, and was shot down with a permissible explosive and black powder. The tipple had bar screens 16 feet long with 2-inch spaces, and revolving screens with ½-inch holes. The coal was screened, 75 per cent of the whole output being screenings. About 500 tons of screenings was coked daily. The coal shipped was picked on the car by three trimmers.

The mine, at the time of sampling in April, 1910, had a capacity of 1,600 tons and an estimated average daily output of 800 tons, which was derived chiefly from advance work.

For chemical analyses of this coal see part I of this bulletin, pp. 292, 293.

THOMAS. THOMAS NO. 34 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 474, 475, 476, 10456 (p. 293).

Mine.—Thomas No. 34; Potomac district; a shaft mine, 186 feet in depth, at Thomas, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Lower Kittanning or Davis. Carboniferous age, Allegheny formation. The bed at the mine has an average thickness of 5 feet, and varies from 3½ to 6 feet. The roof is a hard gray shale with an occasional sandstone roll. The shale has rather a smooth surface and comes down in few places. A hard underclay forms the floor. It is smooth and did not get mixed with the coal.

The bed was measured and sampled at three points by Henry Hinds on April 20, 1910, as described below:

Sections of coal bed in Thomas No. 34 mine at Thomas.

Section	A		B		C	
Laboratory No	474		475		476	
Roof, sandstone and shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Bone	..	..	[a] 0	3½	[a] 0	1
Top coal	0	6¼	1	8	0	6⅛
Bony coal	[a] 0	7	[a] 0	9⅞	0	⅛
Coal	0	2½	0	5¼	0	⅞
Shale	0	⅛	0	¼	0	⅛
Coal	0	5½	0	2⅜	0	10¼
Shale	[a] 0	2¾	[a] 0	2⅛	[a] 0	2⅞
Bone	[a] 0	2⅛	..	..	..	..
Coal	2	9½	3	4	3	6½
Coal	0	7¾	..	..	..	..
Floor, fire clay.						
Thickness of bed	5	7½	6	11⅜	5	3⅞
Thickness of coal sampled	4	7⅝	5	7⅞	5	0

[a] Not included in sample.

Section A (sample 474) was cut from face of Birge heading.

Section B (sample 475) was cut from room 6, off Roberts heading.

Section C (sample 476) was cut from face of right heading 2, off Foreman heading.

A composite sample was made by mixing face samples 474, 475, and 476 for an ultimate analysis, the results of which are shown under laboratory No. 10456.

Notes.—The coal at this mine was undercut with hand picks in the bottom part of the bed, and was shot down with black blasting powder. There was a 16-foot bar screen with 1½-inch spaces between bars, but was not in use. The coal was loaded in run-of-mine form. The mine had a capacity of 600 tons per day at time of sampling in April, 1910, but the actual average daily output was 300 tons. Increase of the daily capacity of the mine to 1,000 tons was contemplated, the greater part of the tonnage to be derived from advance work. There was 1,000 acres of coal to be taken out by this mine.

For chemical analyses of this coal see part I of this bulletin, p. 293.

THOMAS. COKETON NO. 26 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 477, 478, 479, 10430 (p. 293).

Mine.—Coketon No. 26; Potomac district; a drift mine 1¼ miles southwest of Thomas, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The bed at the mine has an average thickness of 6 feet, and varies from 2 to 7½ feet. The roof is a gray shale with a smooth surface. A hard fire clay or shale forms the floor. It is smooth and did not get mixed with the coal in shoveling.

The bed was measured and sampled at three points by H. Hinds on April 20, 1910, as described below:

Sections of coal bed in Coketon No. 26 mine, 1½ miles southwest of Thomas.

Section	A		B		C	
Laboratory No	477		478		479	
Roof, sandstone and shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Top coal	1	7¼	1	7¼	..	..
Bony coal [a]	0	1¾	0	7	..	..
Bone [a]	0	1⅞	..	..	..	..
Coal [a]	0	⅜	..	..	..	..
Bone [a]	0	7¾	..	..	0	4¾
Coal [a]	0	2¼	0	3½	..	..
Bone [a]	0	4½	..	..	0	6¼
Coal	0	4⅛	..	..	0	9¾
Bone [a]	0	3	0	10⅛	0	⅞
Coal	0	8⅝	0	6¼	0	2
Bone [a]	0	3⅛	0	1⅞	0	1⅞
Coal	2	9¼	3	3	2	4¼
Floor, shale and fire clay.						
Thickness of bed	7	6⅞	7	3	4	5¾
Thickness of coal sampled	5	5¼	5	4½	3	4

[a] Not included in sample.

Section A (sample 477) was cut from face of room 3, off east heading.

Section B (sample 478) was cut from face of left heading 3.

Section C (sample 479) was cut from face of right heading 3.

A composite sample was made by mixing face samples 477, 478, and 479 for an ultimate analysis, the results of which are shown under laboratory No. 10430.

Notes.—The coal at this mine was undercut with hand picks in the bottom coal, and was shot down with black blasting powder. The coal was loaded as run-of-mine, and was picked on car by three trimmers. The daily output of the mine in April, 1910 was 350 tons, and a maximum day's output was 600 tons, derived from both pillar and advance work. There were 800 acres of coal to be taken out by this mine.

For chemical analyses of this coal see part I of this bulletin, p. 293.

THOMAS. COKETON NO. 36 (OLD NO. 2) MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 398, 399, 400, 401, 402, 10432 (p. 293).

Mine.—Coketon No. 36 or Old No. 2; Potomac district; a drift mine 1½ miles southwest of Thomas, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Lower Kittanning. Carboniferous age, Allegheny formation. The bed at this time has an average thickness of 4 feet 7 inches, and varies from 3½ feet to 5 feet 3 inches. The roof is a fragile draw slate that causes considerable trouble. A hard fire clay generally forms the floor. However, in places are shale and bony coal of variable smoothness and quality. Both the roof and floor become mixed more or less with the coal.

The bed was measured and sampled at four points by G. S. Pope on April 19, 1910, as described below:

Sections of coal bed in Coketon No. 36 (or Old No. 2) mine, 1½ miles southwest of Thomas.

Section	A		B		C		D	
Laboratory No	398, 399		400		401		402	
Roof, sandstone and shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9½	0	8	0	4	0	7
Sulphur	0	¼	..	..	0	¼	..	..
Coal	2	9½	1	10¼	1	11½	1	10
Hard black shale [a]	3	7½	2	7	1	3	1	1½
Coal	0	4	..	..	..	..	2	5½
Sulphur	0	½	..	..	..	..	..	..
Coal	1	2¼	3	5	3	5¼	1	2¼
Floor, bastard coal.								
Thickness of bed	8	9¼	8	6¼	7	0	7	2¼
Thickness of coal sampled	..	..	5	11¼	5	9	6	¾

[a] Not included in sample.

Section A (samples 398 and 399) was cut from near face of straight bullwheel heading. Two samples were taken: 398 from the upper bench, and 399 from the lower bench. Sample 398 included a 43½-inch cut; sample 399 included an 18½-inch cut.

Section B (sample 400) was cut from face of Arthur heading, 2 miles from drift mouth.

Section C (sample 401) was cut from face of Ryan heading, 2 miles from drift mouth.

Section D (sample 402) was cut from southeast heading pillar in shaft working of No. 34 mine, 900 feet from Arthur heading and 2 miles from drift mouth.

A composite sample was made by mixing face samples 398, 399, 400, 401, and 402 for an ultimate analysis, the results of which are shown under laboratory No. 10432.

Notes.—The coal at this mine was undercut in the bottom part of the bed with hand picks, and was shot down with black blasting powder. Very little explosive was used as most of the coal was mined with pick. The tipple, which was of steel, was equipped with bar screens 20 feet in length with 1½-inch spaces. About 50 per cent of the coal was screened, the remainder being loaded as run of mine. An average of 225 tons of screenings was coked daily. The coal was picked on the cars by three trimmers. The mine had a capacity of 2,000 tons, and the estimated average daily output was 700 tons, which was derived from both advance work and pillars. The output was to be gradually increased in the future. The mine promised to continue to produce coal for 12 years.

For chemical analyses of this coal see part I of this bulletin, p. 293.

THOMAS. COKETON NO. 37 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 480, 481, 482, 10449 (p. 294).

Mine.—Coketon No. 37; Potomac district; a drift mine, 1½ miles southwest of Thomas, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Lower Kittanning or Davis. Carboniferous age, Allegheny formation. The bed at the mine has an average thickness of 5 feet 2 inches, and varies from 3½ to 6 feet. The roof is a gray fossiliferous shale with smooth surface. A fire clay of medium hardness forms the floor. It is smooth and does not get mixed with the coal.

The bed was measured and sampled at three points by H. Hinds on April 21, 1910, as described below:

Sections of coal bed in Coketon No. 37 mine, 1½ miles southwest of Thomas.

Section	A		B		C	
Laboratory No	481		480		482	
Roof, sandstone and shale.	Ft.	in.	Ft.	in.	Ft.	in.
Bony coal	[a] 0	1⅜	..	..	..	..
Coal	1	2¼	0	6⅝	1	1¾
Bony coal	0	¼	0	⅛	[a] 0	3⅞
Coal	0	6⅝	0	2½	1	4⅛
Shale	[a] 0	2	[a] 0	2⅞	[a] 0	3
Coal	..	..	1	9⅝	..	..
Shale	..	..	0	⅛	..	..
Coal	..	..	0	10¼	..	..
Shale	..	..	0	⅛	..	..
Coal	3	5½	0	5½	3	4⅜
Floor, fire clay.						
Thickness of bed	5	6	4	1¾	6	5⅛
Thickness of coal sampled	5	2⅝	3	10⅞	5	10¼

[a] Not included in sample.

Section A (sample 481) was cut from face of left heading 1, off Pratt entry.

Section B (sample 480) was cut from face of north heading 4.

Section C (sample 482) was cut from face of room 2, off Clark heading.

A composite sample was made by mixing the face samples 480, 481, and 482 for an ultimate analysis, the results of which are shown under laboratory No. 10449.

Notes.—The coal at this mine was undercut with hand picks in the bottom part of the bed, and was shot down with black blasting powder. There were 1½-inch screens; the screenings were coked. The mine had a capacity of 600 tons, but at the time of sampling the actual daily output was 300 tons, derived mainly from advance work. There was 1,000 acres to be worked.

For chemical analyses of this coal see part I of this bulletin, p. 294.

THOMAS. THOMAS NO. 24 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 407, 408, 409, 10433 (p. 294).

Mine.—Thomas No. 24; Potomac district; a drift mine, 1½ miles southwest of Thomas, on the Western Maryland and the Baltimore & Ohio railroads.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The bed as mined has an average thickness of 7 feet, and varies from 4½ to 7¾ feet. The roof is of shale of good quality with smooth surface. The floor is a hard shale with smooth and rolling surface.

The bed was measured and sampled at three points by P. M. Riefkin on April 18, 1910, as described below:

Sections of coal bed in Thomas No. 24 mine, 1½ miles southwest of Thomas.

Section	A		B		C	
Laboratory No	407		409		408	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.						
Coal (gray)	0	5	0	5¼	..	..
Coal (bright)	0	2¾	0	1/16	..	..
Coal (hard gray)	0	2⅝	0	6	[a] 1	0
Mother coal	0	1/16	0	⅛	..	..
Coal	0	6⅝	0	4¾	0	6
Bony coal	[a] 2	1¾	[a] 0	7¾	[a] 0	8¾
Coal	0	5	0	6⅞	0	9
Shale and bony coal	[a] 0	2½	0	1/16	0	⅛
Coal (gray)	0	8	0	10⅜	1	0
Coal (bright)	0	1	..	..	..	..
Coal	0	9½	0	5½	0	2½
Mother coal	0	1/16	..	..	..	..
Coal	2	1	2	2⅜	1	¾
Floor, hard shale.						
Thickness of bed	7	9⅞	6	1⅛	5	3⅛
Thickness of coal sampled	5	5⅝	5	5⅜	3	6⅜

[a] Not included in sample.

Section A (sample 407) was cut from crosscut between right heading 1 and air course, 1,100 feet southwest of drift mouth.

Section B (sample 409) was cut from face of main heading, 850 feet southwest of drift mouth.

Section C (sample 408) was cut from face of room 7 off left entry 1, 800 feet southeast of drift mouth.

A composite sample was made by mixing the face samples 407, 408, and 409 for an ultimate analysis, the results of which are shown under laboratory No. 10433.

Notes.—The coal at this mine was overcut in the top part of the bed with hand picks, and was lifted with black powder. There were no screens at the tipple, the entire output being loaded as run-of-mine coal. Three trimmers picked the coal as it was loaded on the car. The capacity of the mine at time of sampling in April, 1910, was 600 tons, and the average daily output was 170 tons. The tonnage was derived from both advance work and pillars in equal proportions. It was intended to install motor haulage at an early date and to increase the output greatly.

For chemical analyses of this coal see part I of this bulletin, p. 294.

THOMAS. THOMAS NO. 25 MINE.

Sample.—Semibituminous coal; Upper Potomac field; analyses Nos. 403, 404, 405, 406, 10434 (pp. 294, 295).

Mine.—Thomas No. 25; Potomac district; a slope mine 1½ miles from Thomas, on the Western Maryland Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The bed at this mine has an average thickness of 6 feet 7 inches, and varies from 2 to 8 feet. The roof is a gray fossiliferous shale with smooth surface. The floor is fairly hard fire clay and shale which have a smooth surface and do not get mixed with the coal.

The bed was measured and sampled at four points by H. Hinds on April 19, 1910, as described below:

Sections of coal bed in Thomas No. 25 mine, 1½ miles from Thomas.

Section	A		B		C		D	
Laboratory No.	403		404		405		406	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Roof, shale.								
Bone	[a] 0	5	[a] 0	1½	[a] 0	3	..	..
Coal (dull)	0	5⅜	1	6⅛	1	4⅞	1	4⅛
Coal (bony)	[a] 0	4	[a] 0	5⅜	[a] 0	8	[a] 0	6⅞
Bony coal	[a] 0	3⅛	0	6¼	0	2¼	[a] 0	4⅛
Bony coal and bone	[a] 0	3¾	[a] 0	8⅞	[a] 0	11¾	[a] 0	6
Coal (bright)	0	4⅜	0	7¼	..	..	[a] 0	2¼
Charcoal	0	¼	..	..	0	⅜	..	..
Bone	[a] 0	4½	[a] 0	4⅛	..	..	[a] 0	3¼
Coal (bright)	0	3⅜	0	10⅛	0	5¾	0	8⅛
Sulphur	0	⅜	0	¼	0	1	0	¼
Bone	..	..	..	..	0	⅞	..	..
Sulphur	..	..	..	..	0	⅛	..	..
Coal (hard)	1	3	..	..	1	5⅞	1	2¾
Coal (gray band)	..	..	..	..	0	5½	0	3½
Coal (soft)	1	3¾	2	⅛	1	7½	1	6¼
Floor, fire clay and shale.								
Thickness of bed	5	4⅞	7	2	7	8⅞	6	11½
Thickness of coal sampled	3	8½	5	6⅛	5	10⅛	5	1

[a] Not included in sample.

Section A (sample 403) was cut from face of Stuart heading.

Section B (sample 404) was cut from face of room 13, off Weaver heading.

Section C (sample 405) was cut from face of room 1, off Roundhouse heading.

Section D (sample 406) was cut from face of room 5, off left entry 7.

A composite sample was made by mixing the face samples 403, 404, 405, and 406 for an ultimate analysis, the results of which are shown under laboratory No. 10434.

Notes.—The coal at this mine was undercut by hand in the bottom part of bed, and was shot down with permissible explosives and with black blasting powder. There were no screens at the tipple, the coal being loaded in run-of-mine form. Three pickers were on the car while loading. The mine had loaded 800 tons in one day, but at the time of sampling in April, 1910, the actual daily output was 500 tons, derived from both advance and pillar work. Increase of the daily output to 1,000 tons was contemplated. There was 1,000 acres of coal to be taken out by this mine.

For chemical analyses of this coal see part I of this bulletin, pp. 294, 295.

UPSHUR COUNTY.

ADRIAN. FLORENCE MINE.

Sample.—Bituminous coal; Tygart River field; analyses Nos. 8986, 8987, 8988, 9033 (p. 295).

Mine.—Florence; Monongahela district; a drift mine at Adrian, on the Coal & Coke Railroad.

Coal bed.—Known in this field as the Upper Freeport. Carboniferous age, Allegheny formation. The coal at this mine averages 5½ feet in thickness, and has a bony-coal band and a shale band which are persistent. The roof is a hard gray shale with smooth surface, is 5 feet in thickness, and overlain with a sandstone. The floor is a hard gray underclay with smooth surface to which the coal does not stick.

The bed was measured and sampled at three points by J. J. Rutledge on September 1, 1909, as described below:

Sections of coal bed in Florence mine at Adrian.

Section	A		B		C	
Laboratory No	8987		8988		8986	
Roof: sandstone and hard shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	9½	0	9	0	9
Bony coal [a]	0	9	1	1	0	9
Coal	3	½	2	8½	3	2
Shale, gray [a]	0	1½	0	2	0	2
Coal	1	3	0	½	0	11
Bony coal	..	..	0	½	..	..
Coal	..	..	1	0	..	..
Floor: hard underclay.						
Thickness of bed	5	11½	5	9½	5	9
Thickness of coal sampled	5	1	4	6½	4	10

[a] Not included in sample.

Section A (sample 8987) was cut from the face of room 1, off main entry, 500 feet southeast of the drift mouth.

Section B (sample 8988) was cut from the face of room 19, off main entry, 800 feet southeast of the drift mouth.

Section C (sample 8986) was cut from the face of butt entry 1, off flat left entry 1, 900 feet southwest of drift mouth.

A composite sample was made by mixing the face samples 8986, 8987, and 8988 for an ultimate analysis, the results of which are shown under laboratory No. 9033.

Notes.—The coal at this mine was undercut by hand, and was shot down with black powder. It was all shipped in run-of-mine form, and was not picked after it came from the mine. The capacity of the mine was 500 tons, the average daily output being 300 tons. The mine had a large area of coal. The output for the near future was to be derived entirely from advance work. A larger tipple was to be built.

For chemical analyses of this coal see part I of this bulletin, p. 295.

WEBSTER COUNTY.

COWEN. HOOVER COUNTRY BANK.

Sample.—Bituminous coal; Elk River field; analysis No. 1237 (p. 295).

Location.—Hoover country bank; just north of Devils Gate, at head of Birch River, 2 miles northwest of Cowen.

Coal bed.—Possibly the same as Eagle coal of Kanawha River, about the age of Sharon coal of the Pottsville of Ohio and Pennsylvania. Dip, to northwest; roof, cannel shale 8 feet thick, separated from the coal by 3 feet of coal and shale; floor, light-drab clay.

The bed was measured and sampled by G. H. Ashley on October 7, 1904.

The sample was obtained from a pile of several tons at the mouth of the drift. About a bushel of coal from various parts of the pile was thrown together, broken down, and quartered.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Prof. Paper 48, p. 274.

WYOMING.

BIGHORN COUNTY.[a]

CODY. CODY MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5766 (p. 295).

Mine.—Cody. A drift mine, 3 miles northeast of Cody, in sec. 22, T. 53 N., R. 101 W.

Coal bed.—This bed is of Cretaceous age; Montana group. The bed dips 56° E.

The bed was sampled and measured by E. G. Woodruff on September 20, 1907, as shown below:

Section of coal bed in Cody mine, 3 miles northeast of Cody.

Laboratory No	5766	
	Ft.	*in.*
Coal	2	6
Parting [a]	0	1
Coal	2	0
Thickness of bed	4	7
Thickness of coal sampled	4	6

[a] Not included in sample.

The sample was taken 175 feet from the opening.

Notes.—The coal is black with a pitchy luster and is moderately hard. Horsepower machinery was installed, and a few hundred tons of coal had been taken out before the mine closed in 1907.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

CODY. ALLISON MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5763 (p. 295).

Mine.—Allison. A slope mine in the NE. ¼ SE. ¼ sec. 25, T. 55 N., R. 102 W., on the east side of Skull Creek, a branch of Pat O'Hara Creek, 15 miles northwest of Cody.

Coal bed.—The bed is Cretaceous age, Eagle sandstone. The bed dips 23°, and is about 4 feet 4 inches thick. The roof is thin shale overlain with massive sandstone.

The bed was measured and sampled by E. G. Woodruff in 1907, as shown below:

Section of coal bed in Allison mine, 15 miles northwest of Cody.

Laboratory No	5763	
Roof, shale under sandstone.	*Ft.*	*in.*
Coal	0	6
Shale [a]	0	2
Coal	0	6
Shale [a]	0	7
Coal	0	9
Shale [a]	0	2
Coal	1	8
Thickness of bed	4	4
Thickness of coal sampled	3	5

Notes.—The coal is a good subbituminous coal suitable for domestic purposes. About 250 tons had been taken out for use at neighboring ranches at time of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

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[a] Certain cities and towns now included in Park County are here listed under Bighorn County.

KIRBY. PRICE AND JONES MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5788 (p. 295).

Mine.—Price and Jones, near Kirby, in the SW. ¼ sec 22, T. 44 N., R. 95 W.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed is 6 feet of coal with 1 foot of shale for roof.

The bed was measured and sampled by E. G. Woodruff on September 11, 1907. The sample was taken from a 6-foot cut of coal, 150 feet from the mine opening.

Notes.—The mine was opened about 7 years previous to the time of sampling, and was operated during the fall, winter, and early spring. About 1,000 tons had been taken from it and sold locally for $2.50 per ton.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

KIRBY. GEBO MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5787 (p. 295).

Mine.—Gebo. A drift mine. Pit No. 1, 2 miles southwest of Kirby, in the S. ½ sec. 11, T. 44 N., R. 95 W.

Coal bed.—The bed is Cretaceous age, Eagle sandstone. The bed is about 11 feet thick and dips 22°. Roof is 6 inches of sandstone overlain with shale.

The bed was measured and sampled by E. G. Woodruff on September 11, 1907, the sample being taken from an 11-foot 1-inch cut of coal.

Notes.—From 20 to 65 men had been employed in the mine since its opening in November, 1906. About 8,000 tons had been mined, but most of this was the product of development work previous to the construction of the Burlington Railroad. A spur track had been completed to the mine at time of sampling and was being extended to mine No. 2, ¾ mile southeast. A large tipple had been constructed and the mine was expected to produce 500 tons per day, which was to be supplied to railroads and shipped to various places in the Bighorn Basin and adjacent areas.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

KIRBY. CROSBY MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 6707 (p. 295).

Mine.—Crosby; in sec. 18, T. 44 N., R. 94 W., 2 miles southwest of Kirby.

Coal bed.—In the Eagle sandstone, Cretaceous age. Cover, 150 feet.

The bed was measured and sampled in 1908 by E. G. Woodruff. The sample represented a 7½-foot cut of coal. It was taken in the main entry, 600 feet in mine.

For chemical analyses of this coal see part I of this bulletin, p. 295.

For a description of the geologic relations of the coal bed see U. S. Geol. Survey Bull. 381, p. 177.

KIRBY. EADES MINE.

Sample.—Subbituminous coal; Bighorn Basin (Gebo) field; analysis No. 5765 (p. 295).

Mine.—Eades; 11 miles southwest of Kirby, in sec. 33, T. 44 N., R. 96 W., Bighorn County.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed dips 9°. The bed is about 45 inches thick. The bed was measured and sampled by E. L. De Golyer on September 7, 1907, the sample being taken from a 3¾-foot cut of coal.

Notes.—The main entry was 150 feet long, with 2 rooms, from which about 200 tons of coal had been removed.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

KIRBY. NOWATER MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 6708 (p. 295).

Mine.—A drift mine on Nowater Creek, in sec. 19, T. 44 N., R. 90, 24 miles east of Kirby.

Coal bed.—The bed is Cretaceous age, Eagle sandstone. The bed is about 6 feet thick with a 7-inch shale parting near the top. Bed dips 23° N.

The bed was measured and sampled on August 29, 1908, by E. G. Woodruff, as shown below:

Section of coal bed in Nowater mine, 24 miles east of Kirby.

Laboratory No.	6708	
	Ft.	*in.*
Coal	0	6
Shale [a]	0	7
Coal	4	11
Thickness of bed	6	0
Thickness of coal sampled	5	5

[a] Not included in sample.

The sample was taken 100 feet from surface, at end of entry.

Notes.—About 150 tons had been mined at time of sampling and conditions at the mine were favorable to more extensive development, but the region is uninhabited and reached only over poor roads. The coal is pitch-black with a vitreous luster, moderately hard, shows a dark-brown streak on glazed porcelain, and seems to slack slowly on exposure.

For chemical analyses of this coal see part I of this bulletin, p. 295; also U. S. Geol. Survey Bull. 381, p. 183.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 173.

MANDERSON. ROGERS AND GAPIN MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5778 (p. 296).

Mine.—Rogers and Gapin; 1½ miles north of Manderson, and 7 miles southeast of Basin, in sec. 19, T. 50 N., R. 92 W.

Coal bed.—The bed is Tertiary age; Fort Union formation. The bed is about 6 feet 2 inches thick.

The bed was measured and sampled by C. A. Fisher in 1907, as shown below:

Section of bed in Rogers and Gapin mine, 1½ miles north of Manderson.

Laboratory No.	5778	
	Ft.	*in.*
Coal	1	1
Shale, impure, coaly [a]	0	1
Coal	0	8
Shale, black [a]	0	2
Coal	0	7
Clay, dark gray [a]	0	6
Coal	0	5
Shale, coaly [a]	0	2
Coal	0	11
Clay, dark gray [a]	0	2
Coal	1	3
Thickness of bed	6	0
Thickness of coal sampled	4	11

[a] Not included in sample.

Notes.—The thin partings of shale are hard to remove in mining and make the commercial product dirty. The coal is too friable to be well adapted to washing.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 198.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 167.

MEETEETSE. BLACK DIAMOND MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5768 (p. 296).

Mine.—Black Diamond; in sec. 28, T. 49 N., R. 100 W., 3 miles northwest of Meeteetse.

Coal bed.—The bed is Cretaceous age, Eagle sandstone. The bed dips 20° E. and is 42 inches thick, with no continuous partings.

The bed was measured and sampled by E. G. Woodruff on August 14, 1907, as shown below:

Section of bed in Black Diamond mine, 3 miles northwest of Meeteetse.

Laboratory No	5768 *Ft.*	 *in.*
Bone [a]	0	2
Coal	3	6
Thickness of bed	3	8
Thickness of coal sampled	3	6

[a] Not included in sample.

Notes.—The mine consisted of one gangway 400 feet long, with 8 rooms. One man was employed during summer months and five during winter. It was estimated that 5,000 tons had been taken out since opening. The coal had been sold to local ranchmen along Grey Bull Valley and in Meeteetse. It is moderately hard, black, ignites readily, and makes an excellent fuel; but slacks when exposed to the air.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

MEETEETSE. GREY BULL OR ERSKINE MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5769 (p. 296).

Mine.—Grey Bull or Erskine; 2½ miles southwest of Meeteetse, in the SE. ¼ sec. 13, T. 48 N., R. 101 W., Bighorn County.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed dips 12° NE., and is about 6 feet 4 inches thick.

The bed was measured and sampled by E. G. Woodruff on August 14, 1907, as shown below:

Section of Grey Bull or Erskine mine, 2½ miles southwest of Meeteetse.

Laboratory No	5769 *Ft.*	 *in.*
Coal	0	10
Shale [a]	0	5
Coal	1	3
Bone [a]	0	2
Coal	0	7
Shale [a]	0	9
Coal	2	4
Thickness of bed	6	4
Thickness of coal sampled	5	0

[a] Not included in sample.

Notes.—The mine is near a river, and the bed dips below water level, making it difficult to keep the mine dry. At time of sampling, about 4,500 tons had been mined and sold chiefly for domestic use. The coal is medium hard. As mined it included considerable dirt.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

MEETEETSE. ORR MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5764 (p. 296).

Mine.—Orr. A drift mine about 10 miles northwest of Meeteetse, 3 miles northwest of Gray's ranch, on Horse Creek, in the NE. ¼ sec. 7, T. 49 N., R. 101 W.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed dips 21° E.; contains 48 inches of coal in two benches of about equal thickness, the upper bench being 22 inches and the lower 26 inches thick.

The bed was measured and sampled by E. G. Woodruff on August 14, 1907, the sample being taken from a 4-foot cut of coal. The sample was taken 125 feet from mine opening.

Notes.—The coal is brownish-black and typical of the Eagle coals. When fresh it has a bright luster, well-developed joints, and makes a desirable domestic fuel. If a market were accessible, this mine could be extended and a large amount of coal taken out.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

MEETEETSE. MAYFIELD PROSPECT.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5770 (p. 296).

Mine.—Mayfield prospect; on Grass Creek, 19 miles southeast of Meeteetse, and 8 miles west of Ilo, in sec. 26, T. 46 N., R. 99 W.

Coal bed.—The bed is Tertiary age; Fort Union (?) formation. The bed is about 32 feet thick.

The bed was measured and sampled by E. G. Woodruff in 1907, the sample being taken from a 32-foot cut of coal, slightly weathered.

Notes.—This district had been extensively prospected but was wholly undeveloped owing to inaccessibility to market. The coal is moderately hard, burns well, seems to stand exposure to the air, and as a domestic coal is satisfactory.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

TENSLEEP. UNOPERATED MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 6709 (p. 296).

Mine.—Unoperated; in the badlands at head of north fork of Bud Kimball Draw, in sec. 33, T. 46, R. 89 W.; 12 miles southwest of Tensleep.

Coal bed.—The bed is Tertiary age, Fort Union formation. Bed is about 5 feet 8 inches thick; cover 50 feet thick.

The bed was measured and sampled by E. G. Woodruff on August 29, 1908, as shown below:

Section of coal bed in unoperated mine, 12 miles southwest of Tensleep.

Laboratory No	6709	
	Ft.	*in.*
Coal	0	2
Sandstone [a]	0	2
Coal	5	6
Thickness of bed	5	10
Thickness of coal sampled	5	8

[a] Not included in sample.

The sample was taken 150 feet from opening, in side of main entry.

Notes.—More coal had been taken out of this mine than from any other in the southeastern part of this field, but at time of sampling it was abandoned on account of distance from settlements. Though the face from which sample was taken had been exposed for several months, there was no visible evidence of weathering. The coal was dry and the mine dusty, consequently the analysis probably shows result of oxidation and less moisture than will be found when the mine is extended deeper.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 381, p. 183.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 173.

WILEY. WEST WILEY MINE.

Sample.—Subbituminous coal; Bighorn Basin field; analysis No. 5767 (p. 296).

Mine.—West Wiley. A slope mine southwest of Oregon Basin, at base of Frost Ridge, in the SE. ¼ sec. 34, T. 51 N., R. 101 W., 4 miles southwest of Wiley.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed dips 28°, and contains about 5 feet of coal at the mine.

The bed was measured and sampled by E. G. Woodruff in 1907, as shown below:

Section of coal bed in West Wiley mine, 4 miles southwest of Wiley.

Laboratory No.	5767	
	Ft.	*in.*
Coal	0	6
Shale [a]	0	8
Coal	3	2
Thickness of bed	4	4
Thickness of coal sampled	3	8

[a] Not included in sample.

Notes.—The mine was operated chiefly to supply coal to the company that was constructing irrigation works in the vicinity. A small part was sold for domestic use. The coal has been badly crushed by the uplift of the beds, and as a consequence breaks irregularly and yields a high percentage of fine coal in mining. The annual output was about 150 tons.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

WILEY. EAST WILEY MINE.

Sample.—Subbituminous coal; Bighorn Basin (Cody) field; analysis No. 5762 (p. 296).

Mine.—East Wiley. A slope mine on the east side of the Oregon Basin, 6 miles east of Wiley, in sec. 10, T. 51 N., R. 100 W.

Coal bed.—The bed is Cretaceous age; Eagle sandstone. The bed is about 42 inches thick.

The bed was measured and sampled by E. G. Woodruff on August 7, 1907, as shown below:

Section of coal bed in East Wiley mine, 6 miles east of Wiley.

Laboratory No.	5762	
	Ft.	*in.*
Coal	1	4
Shale [a]	0	2
Coal	0	5
Shale parting	..	..
Coal	1	9
Thickness of bed	3	8
Thickness of coal sampled	3	6

[a] Not included in sample.

Notes.—It was estimated that 200 tons of good subbituminous coal had been taken out of this mine to supply the local ranch trade.

For chemical analyses of this coal see part I of this bulletin, p. 296; also U. S. Geol. Survey Bull. 341, p. 217.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 202.

CARBON COUNTY.

Arlington. Cottontail Mine.

Sample.—Subbituminous coal; Rock Creek field; analysis No. 6641 (p. 296).

Mine.—Cottontail; in the SW. ¼ NW. ¼ sec. 2, T. 18 N., R.,78 W., 4 miles southwest of Arlington.

Coal bed.—The coal bed is 7 feet 6 inches thick; it is a local one in the "Upper Laramie" formation; Cretaceous or Tertiary age, and at time of sampling had not been traced for any great distance.

The bed was measured and sampled in October, 1907, by M. W. Ball, as shown below:

Section of coal bed in Cottontail mine, 4 miles southwest of Arlington.

Laboratory No	6641	
Roof, coarse white sandstone.	*Ft.*	*in.*
Bluish white shale [a]	2	6
Coal	5	0
Floor, light blue shale.		
Thickness of bed	5	0
Thickness of coal sampled	5	0

[a] Not included in sample.

The sample was taken 150 feet in on the entry.

Notes.—The coal had been mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 296.

Baggs. Coal Gulch Opening.

Sample.—Subbituminous coal; Little Snake River field; analysis No. 5447 (p. 297).

Location.—Coal Gulch opening; in the SW. ¼ sec. 24, T. 13 N., R. 91 W., 4½ miles northeast of Baggs.

Coal bed.—The bed is a local one in the "Upper Laramie" formation; Tertiary age.

The bed was measured and sampled by Max W. Ball in September, 1907, as shown below:

Section of coal bed in Coal Gulch opening, 4½ miles northeast of Baggs.

Laboratory No	5447	
Roof, clayey sandstone.	*Ft.*	*in.*
Dirty coal [a]	3	2
Bone [a]	0	3
Dirty coal [a]	0	10
Bone [a]	0	2
Coal [a]	6	0
Coal	6	0
Floor, coal.		
Thickness of bed	16	5
Thickness of coal sampled	6	0

[a] Not included in sample.

The sample was taken 145 feet from the entrance of the opening on the east wall.

Note.—The coal was mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 341, p. 25.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 245.

BAGGS. CUT-OFF GULCH OPENING.

Sample.—Bituminous coal; Little Snake River field; analysis No. 5448 (p. 297).

Location.—Cut-off Gulch opening; in the NE. ¼ NE. ¼ sec. 23, T. 13 N., R. 91 W., 5 miles northeast of Baggs.

Coal bed.—The bed is local, occurring in the "Upper Laramie" formation, Cretaceous or Tertiary age, and at time of sampling had not been traced for any great distance.

The bed was measured and sampled by Max W. Ball in September, 1907, as shown below:

Section of coal bed in opening 5 miles northeast of Baggs.

Laboratory No.	5448	
Roof, gray shale.	*Ft.*	*in.*
Bone [a]	0	4
Dirty coal	6	0
Thickness of bed	6	4
Thickness of coal sampled	6	0

[a] Not included in sample.

The sample was taken 40 feet from the entrance of the opening, on the north wall.

Note.—The coal was mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 341, p. 251.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 245.

BAGGS. MUDDY BRIDGE MINE.

Sample.—Subbituminous coal; Little Snake River field; analyses Nos. 5298, 5342 (p. 297).

Mine.—Muddy Bridge. An untimbered opening about 40 feet deep, sloping about 25°, in the NW. ¼ SW. ¼ sec. 12, T. 15 N., R. 92 W., 20 miles north of Baggs.

Coal bed.—The bed is of Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled in 1907 by Max W. Ball, as shown below:

Sections of coal bed in Muddy Bridge mine, 20 miles north of Baggs.

Laboratory No.	5298		5342	
Roof, shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	1	[a] 2	1
Shale	[a] 0	9	[a] 0	9
Coal	[a] 2	5	2	5
Shale	[a] 0	2	[a] 0	2
Coal	[a] 2	4	2	4
Thickness of bed	7	9	7	9
Thickness of coal sampled	2	1	4	9

[a] Not included in sample.

The samples were taken in main entry, about 40 feet from mouth of mine.

Note.—The "Upper Laramie" coals are not so compact, clean, or black as those of the Mesaverde, and they weather much more rapidly.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 341, p. 251; Bull. 381, p. 200.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 253; Bull. 381, pp. 206, 210.

BAGGS. PROSPECT.

Sample.—Subbituminous coal; Little Snake River field; analysis No. 5299 (p. 297).

Location.—A prospect east of Corlett ranch; in the SE. ¼ SE. ¼ sec. 4, T. 16 N., R. 92 W., 27 miles north of Baggs.

Coal bed.—The coal bed is an unnamed or unnumbered one in the "Upper Laramie" formation; Cretaceous or Tertiary age.

The bed was measured and sampled by M. W. Ball in August, 1907, as shown below:

Section of coal bed in prospect, 27 miles north of Baggs.

Laboratory No.	5299
	Ft. in.
Roof, clay.	
Coal, burned [a]	15 0
Shale [a]	3 0
Coal	2 2
(Bottom not exposed.)	
Thickness of bed	20 2
Thickness of coal sampled	2 2

[a] Not included in sample.

The sample was taken 25 feet from the entrance of the prospect, on the wall.

Notes.—The coal was mined only at long intervals for local use. The bed was separated by 3 feet of shale from 15 feet of burned coal, and had by alteration become of considerably higher grade than near-by coals.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 341, p. 251.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 245.

CARBON. CARBON NO. 2 MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3735, 3664, 3739 (p. 297).

Mine.—Carbon No. 2; in the southeast part of the town of Carbon, in the SW. ¼ SE. ¼ sec. 26, T. 22 N., R. 80 W.

Coal bed.—Main Carbon; Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled at three points by A. C. Veatch, on August 29, 1906, as shown below:

Sections of coal bed in Carbon No. 2 mine at Carbon.

Laboratory No.	3664	3735	3739
	Ft. in.	Ft. in.	Ft. in.
Roof, shale.			
Coal	3 0	3 0	[a] 3 0
Shale	[a] 0 ½	[a] 0 ½	[a] 0 ½
Coal	2 6	2 6	2 6
Shale	[a] 0 ¾	[a] 0 ¾	[a] 0 ¾
Coal	1 6	1 6	1 6
Floor, shale.			
Thickness of bed	7 1¼	7 1¼	7 1¼
Thickness of coal sampled	7 0	7 0	4 0

[a] Not included in sample.

Sample 3664 was taken in an unused room, 60 feet east of slope, 280 feet in mine.

Sample 3735 was taken 300 feet in mine; part of the bed was not sampled because too much weathered.

Sample 3739 was taken 50 feet off slope, 150 feet in mine.

Notes.—The coal mined was rather dirty, but seven mines were operated near Carbon before 1902 to procure coal for the Union Pacific Railroad. The railroad's removal to the north caused the abandonment of the mines opened to supply it. The natural commercial market for coal from this district is small.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 257.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 245.

Carbon. Union Pacific Prospect.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3740, 3741 (p. 297).

Location.—Union Pacific prospect; in the NE. ¼ SE. ¼ sec. 27, T. 22 N., R. 80 W., one-fourth mile west of Carbon.

Coal bed.—Main Carbon. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled by A. C. Veatch on August 23, 1906, as shown below:

Section of coal bed in prospect, ¼ mile west of Carbon.

Laboratory No.	3740	
	Ft.	in.
Roof, shale.		
Coal	0	8
Shale [a]	0	½
Coal	2	3
Dirty coal [a]	0	6
Coal	1	2
Floor, shale.		
Thickness of bed	4	7½
Thickness of coal sampled	4	1

[a] Not included in sample.

Sample 3741 was taken 140 feet from mouth of slope.

For chemical analyses of this coal, see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 257.

For geologic relations, see U. S. Geol. Survey Bull. 316, p. 245.

Carbon. Carbon No. 7 Mine.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3742, 3743 (p. 297).

Mine.—Carbon No. 7; 2½ miles southeast of Carbon, in the SW. ¼ SE. ¼ sec. 36, T. 22 N., R. 80 W.

Coal bed.—Main Carbon. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled by A. C. Veatch on August 30, 1906, as shown below:

Section of coal bed in Carbon No. 7 mine, 2½ miles southeast of Carbon.

Laboratory No.	3743		3742	
	Ft.	in.	Ft.	in.
Roof, shale.				
Coal	3	0	5	2
Shale	[a] 0	1	[a] 0	8
Coal	2	2	2	10
Dirty coal	[a] 0	6	..	..
Coal	2	0	..	..
Thickness of bed	7	9	8	8
Thickness of coal sampled	7	2	8	0

[a] Not included in sample.

Sample 3742 was taken 850 feet from mine entrance.

Sample 3743 was taken 800 feet from mouth of slope.

For chemical analyses of this coal, see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 257.

For geologic relations, see U. S. Geol. Survey Bull. 316, p. 250.

Carbon. Prospect.

Sample.—Subbituminous coal; Hanna field; analysis No. 3647 (p. 297).

Location.—Prospect; near Johnson's sheep camp; in the SE. ¼ SE. ¼ sec. 20, T. 21 N., R. 79 W., 6 miles southeast of Carbon. No railroad connection.

Coal bed.—The bed is of Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 21, 1906, by Max A. Pishel, as shown on the following page.

Section of coal bed in prospect, 6 miles southeast of Carbon.

Laboratory No	3647	
	Ft.	*in.*
Bone [a]	0	4½
Coal	1	9
Shale [a]	0	2
Coal [a]	0	1
Bone [a]	0	6
Coal	1	6
Shale [a]	0	1
Coal [a]	0	4
Bone [a]	0	6
Thickness of bed	5	3½
Thickness of coal sampled	3	3

[a] Not included in sample.

The sample was probably weathered.

For chemical analyses of this coal, see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 255.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 245.

CARBON. PROSPECT.

Sample.—Bituminous (?) coal; Carbon field; analysis No. 3649 (p. 297).

Location.—Prospect; in the SE. ¼ NW. ¼ sec. 34, T. 21 N., R. 79 W., 9 miles southeast of Carbon.

Coal bed.—The bed is Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1906 by A. C. Veatch, as shown below:

Section of coal bed in prospect, 9 miles southeast of Carbon.

Laboratory No	3649	
Roof, shale.	*Ft.*	*in.*
Coal	1	6
Dirt [a]	0	½
Coal	2	0
Dirt [a]	0	¾
Coal	1	0
Thickness of bed	4	7¼
Thickness of coal sampled	4	6

[a] Not included in sample.

Notes.—The best coals of the Carbon field are in the Mesaverde formation, which contains the high-grade coals of the Routt County, Colo., field. They are as a rule bright, brittle, and noncoking. These Mesaverde coals are not so good as the Frontier coals of Uinta County, Wyo., mined at Cumberland, Diamondville, and Frontier.

For chemical analyses of this coal, see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 256.

For geologic relations, see U. S. Geol. Survey Bull. 316, p. 246.

CARBON. ABANDONED MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3648, 3645 (p. 297).

Mine.—Abandoned mine; 12 miles south of Carbon, in the SW. ¼ NW. ¼ sec. 28, T. 21 N., R. 80 W.

Coal bed.—The bed is of Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled by A. C. Veatch on August 24, 1906, as shown on the following page.

Sections of coal bed in abandoned mine, 12 miles south of Carbon.

	Ft.	in.
Roof, sandstone.		
Coal[a]	3	0
Parting shale	0	3
Coal[a]	1	0
Shale	0	1
Coal	2	0
Shale	0	4
Coal[a]	2	0
Shale	0	3
Coal[b]	1	0
Shale	0	½
Coal[b]	3	0
Floor, shale.		
Thickness of bed	12	11½

[a] Included in sample 3648.

[b] Included in sample 3645.

The samples were taken 280 feet from opening. Sample 3648 represents the upper bench and sample 3645 the lower bench.

For chemical analyses of this coal see part I of this bulletin, p. 297: also U. S. Geol. Survey Bull. 316, p. 257.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 246.

COMO. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3736 (p. 297).

Location.—Prospect; in the SW. ¼ NW. ¼ sec. 32, T. 23 N., R. 80 W., 2 miles west of Como.

Coal bed.—The bed is Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 29, 1910, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 2 miles west of Como.

Laboratory No	3736	
	Ft.	in.
Roof, shale.		
Coal	3	6
Shale[a]	0	1
Coal (soft and some dirt)	0	8
Dirty coal[a]	0	8
Coal	1	2
Thickness of bed	6	1
Thickness of coal sampled	5	4

[a] Not included in sample.

The sample was taken 6 feet from mouth of drift.

For chemical analyses of this coal see part I of this bulletin, p. 297; also U. S. Geol. Survey Bull. 316, p. 258.

COMO. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3737, 3738 (p. 298).

Location.—Prospect; in the SE. ¼ NW. ¼ sec. 32, T. 23 N., R. 80 W., 2 miles west of Como.

Coal bed.—The bed is of Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled at one point on August 29, 1906, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 2 miles west of Como.

Laboratory No	3737		3738	
	Ft.	in.	Ft.	in.
Coal	3	2	[a]3	2
Parting	[a]0	½	[a]0	½
Coal	1	9	[a]1	9
Shale	[a]0	1½	[a]0	1½
Coal	1	1	[a]1	1
Shale	[a]0	3	[a]0	3
Coal	[a]6	1	6	1
Thickness of bed	12	6	12	6
Thickness of coal sampled	6	0	6	1

[a] Not included in sample.

The samples were taken 6 feet from opening (surface samples).

The samples probably consisted of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 298; also U. S. Geol. Survey Bull. 316, p. 258.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 246.

COMO. PROSPECT.

Sample.—Subbituminous (?) coal; Hanna field; analysis No. 3739 (p. 298).

Mine.—Prospect; in the SW. ¼ SE. ¼ sec. 26, T. 22 N., R. 80 W., 2 miles west of Como.

Coal bed.—Main Carbon. Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 29, 1906, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 2 miles west of Como.

Laboratory No	3739	
	Ft.	*in.*
Coal [a]	3	0
Parting [a]	0	½
Coal	2	6
Parting [a]	0	¾
Coal	1	6
Thickness of bed	7	1¼
Thickness of coal sampled	4	0

[a] Not included in sample.

The sample was obtained in mine, lower bench, 150 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 298; also U. S. Geol. Survey Bull. 316, p. 257.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 246.

COPPERTON. CARBONDALE MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 6642 (p. 298).

Mine.—Carbondale; in the SE. ¼ SW. ¼ sec. 7, T. 13 N., R. 87 W., 5 miles southwest of Copperton.

Coal bed.—The coal bed is a local one. Cretaceous age; Mesaverde formation. Roof, sandy shale; floor, clay.

The bed was measured and sampled by Max W. Ball in July, 1908; the sample was taken from a 2-foot 10-inch cut of coal. It was obtained from the wall of room about 20 feet from main entry.

Notes.—The coal is a good-grade bituminous; attempts at coking had not been successful, probably due to inexperienced management. The coal was used in a small way, and some was hauled by wagon to the Encampment copper district.

For chemical analyses of this coal see part I of this bulletin, p. 298.

COPPERTON. STEMP SPRINGS MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 6644 (p. 298).

Mine.—Stemp Springs; in the NE. ¼ SW. ¼ sec. 13, T. 13 N., R. 88 W., 6 miles southwest of Copperton.

Coal bed.—The coal bed is a local one. Cretaceous age; Mesaverde formation. The bed had not been traced for any great distance. Roof, sandy shale; floor, bone.

The bed was measured and sampled by Max W. Ball in July, 1908, the sample being taken from a 3-foot 1-inch cut of coal.

The sample was obtained from wall of a regular room about 10 feet from minor entry.

Note.—The coal is good-grade bituminous, and may be a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 298.

DIXON. ANGIER MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 5445, 5446 (p. 298).

Mine.—Angier (old entry); in the SE. ¼ SE. ¼ sec. 6, T. 12 N., R. 89 W., at mouth of Savery Creek, 5 miles east of Dixon.

Coal bed.—The coal bed is a local one. Cretaceous age; Mesaverde formation.

The bed was measured by M. W. Ball in September, 1907, as shown below:

Sections of bed in Angier mine, 5 miles east of Dixon.

Section	A		B	
Laboratory No	5445		5446	
Roof, gray shale.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	[a] 3	0	[a] 4	0
Coal [a]	8	0	7	0
Floor, coal and shaly sandstone.				
Thickness of bed	11	0	11	0
Thickness of coal sampled	8	0	7	0

[a] Not included in sample.

Section A (sample 5445) was taken 440 feet in on the main entry on the west wall.

Section B (sample 5446) was taken about 210 feet from the mine mouth, in north opening from drift driven to left.

Note.—The coal is a good-grade bituminous coal, and may be a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 298.

DIXON. DARLING MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 5449 (p. 298).

Mine.—Darling; in the SW. ¼ SE. ¼ sec. 5, T. 12 N., R. 89 W., near Dixon.

Coal bed.—The coal bed is a local one. Cretaceous age; Mesaverde formation.

The bed was measured and sampled by M. W. Ball in September, 1907.

Section of coal bed in Darling mine, near Dixon.

Laboratory No	5449	
Roof, brown shale.	*Ft.*	*in.*
Coal, good [a]	7	0
Shale [a]	1	0
Coal, good	7	6
Floor, shale.		
Thickness of bed	15	6
Thickness of coal sampled	7	6

[a] Not included in sample.

The sample was taken from the face of drift running northeast from a point in the main entry about 265 feet from the mouth.

Note.—The coal is a good-grade bituminous coal and may be a coking coal.

For chemical analyses of this coal see part I of this bulletin, p. 298.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 190.

DIXON. MARTIN MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 5444 (p. 298).

Mine.—Martin; in the SW. ¼ NW. ¼ sec. 9, T. 12 N., R. 89 W., 7 miles east of Dixon, and 4 miles northwest of Slater, Colo.

Coal bed.—The coal bed is a local one. Cretaceous age; Mesaverde formation. Roof, soft bituminous coal; floor, gray or brown shale.

The bed was measured and sampled by M. W. Ball in September, 1907. The sample represented the upper 7 feet of an 8-foot coal bed. It was obtained 430 feet from the main entry.

Notes.—The coal is a good-grade bituminous coal, and may be a coking coal. It was mined in a small way for local use.

For chemical analyses of this coal see part I of this bulletin, p. 298.

DIXON. LINDE OPENING.

Sample.—Bituminous coal; Little Snake River field; analysis No. 6803 (p. 298).

Mine.—Linde opening; in the SE. ¼ SW. ¼ sec. 8, T. 12 N., R. 88 W., 12 miles east of Dixon.

Coal bed.—The coal bed is a local one in the Mesaverde formation, Cretaceous age, and had not been traced for any great distance. Roof, sandy shale; floor, bone.

The bed was measured and sampled by M. W. Ball in July, 1908, the sample being taken from an 8-foot cut of coal. It was obtained about 40 feet in, on the main entry.

Notes.—The coal is a good-grade bituminous coal, and may be a coking coal. It was mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 298.

ELK MOUNTAIN. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3644 (p. 299).

Location.—Prospect; 1½ miles south of Elk Mountain, in lot 3, sec. 4, T. 20 N., R. 80 W.

Coal bed.—Lower bed, Carbon group. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled by A. C. Veatch, on August 25, 1906, as shown below:

Section of coal bed, 1½ miles south of Elk Mountain.

Laboratory No.	3644	
Roof, shale, overlain with sandstone.	*Ft.*	*in.*
Coal [a]	1	0
Shale [a]	0	5
Coal [a]	0	10
Shale [a]	0	7
Coal [a]	2	2
Shale [a]	0	4
Coal	1	6
Shale [a]	0	2½
Coal	1	6
Shale [a]	0	4
Coal	2	0
Shale [a]	0	4
Coal	2	0
Floor, shale.		
Thickness of bed	13	2½
Thickness of coal sampled	7	0

[a] Not included in sample.

The sample was taken in entry, 11 feet from mouth.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 254.

ELK MOUNTAIN. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3650, 3651 (p. 299).

Location.—Prospect; in the NW. ¼ NE. ¼ sec. 6, T. 20, R. 80 W., 2 miles southwest of Elk Mountain.

Coal bed.—Lower bed of Carbon group. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 24, 1906, by Spencer Logan for A. C. Veatch, as shown on the following page.

Sections of coal bed in prospect, 2 miles southwest of Elk Mountain.

	Ft.	in.
Roof, sandstone.		
Coal [a]	1	2
Bone	0	5
Coal [a]	2	2
Coal, dirty	0	1
Coal [a]	1	6
Bone	0	2
Coal	0	6
Bone	0	3
Coal	1	3
Bone	0	1
Coal [b]	2	4
Bone	0	3
Coal [b]	2	11
Thickness of bed	13	1

[a] Included in sample 3651.

[b] Included in sample 3650.

Sample 3650 represented weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 257.

FORT STEELE. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3924 (p. 299).

Location.—Prospect; in the NW. ¼ NE. ¼ sec. 2, T. 22 N., R. 84 W., 10 miles northeast of Fort Steele.

Coal bed.—Not named. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on October 11, 1906, by Max A. Pishel. The sample was taken from a 5-foot cut of coal from the upper part of the bed. The base of the bed was not exposed. The sample was taken near surface and the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 255.

FORT STEELE. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3927 (p. 299).

Location.—Prospect; in the SW. ¼ SW. ¼ sec. 36, T. 23 N., R. 84 W., 10½ miles northeast of Fort Steele.

Coal bed.—Not named. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on October 11, 1906, by M. A. Pishel. The sample was taken from a 10-foot cut of coal. The base of the bed was not exposed. The sample was obtained near the surface and the coal was considerably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 255.

FORT STEELE. MCCORD PROSPECT.

Sample.—Bituminous coal; Kindt Basin field; analysis No. 3480 (p. 299).

Location.—McCord prospect; in the SW. ¼ NE. ¼ sec. 19, T. 19 N., R. 85 W., Carbon County, 12 miles southwest of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on July 26, 1906, by A. C. Veatch. The coal bed is 5 feet 2 inches thick. The sample represented the entire bed and was obtained in mine 100 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

FORT STEELE. PROSPECT.

Sample.—Bituminous coal; Kindt Basin field; analysis No. 3481 (p. 299).

Location.—Prospect; in the SE. ¼ NW. ¼ sec. 19, T. 19 N., R. 85 W., 12½ miles southwest of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation. The bed was measured and sampled in 1906 by A. C. Veatch, as shown below:

Section of coal bed in prospect, 12½ miles southwest of Fort Steele.

Laboratory No	3481	
	Ft.	*in.*
Coal	2	2
Shale [a]	0	4
Coal	1	8
Thickness of bed	4	2
Thickness of coal sampled	3	10

[a] Not included in sample.

The sample was obtained in main entry, 200 feet from entrance. The coal was probably slightly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

For geologic relations see U. S. Geol. Survey Bull. 316, pp. 247, 253.

FORT STEELE. MILLER PROSPECT.

Sample.—Bituminous (?) coal; Hanna field; analysis No. 3931 (p. 299).

Location.—Miller prospect; in the SE. ¼ NE. ¼ sec. 18, T. 23 N., R. 85 W., 13 miles northwest of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on September 23, 1906, by A. C. Veatch, as shown below:

Section of coal bed in Miller prospect, 13 miles northwest of Fort Steele.

Laboratory No	3931	
	Ft.	*in.*
Bone [a]	1	2
Coal	4	1
Thickness of bed	5	3
Thickness of coal sampled	4	1

[a] Not included in sample.

The sample was a surface sample.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

FORT STEELE. LARSEN MINE.

Sample.—Bituminous coal; Hanna field; analysis No. 3501 (p. 299).

Mine.—Larsen; in the NE. ¼ NE. ¼ sec. 28, T. 19 N., R. 85 W., 14 miles south of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1906 by A. C. Veatch. The sample included 1 foot 4 inches of coal which was underlain with 4½ inches of bone.

The sample was obtained in main entry, 60 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

FORT STEELE. PETTY MINE.

Sample.—Bituminous coal; Hanna field; analysis No. 3509 (p. 299).

Mine.—Petty; in the NW. ¼ SW. ¼ sec. 26, T. 19 N., R. 85 W., 14 miles south of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on July 30, 1906, by A. C. Veatch. The sample included 2 feet 6 inches of clear coal. It was taken in room 4, 300 feet from entrance, and 200 feet to right of main gangway.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

FORT STEELE. PHILLIPS MINE.

Sample.—Bituminous coal; Hanna field; analysis No. 3507 (p. 299).

Mine.—Phillips; in the SW. ¼ NE. ¼ sec. 35, T. 19 N., R. 85 W., 15 miles south of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 1, 1906, by A. C. Veatch. The sample included 2 feet 8 inches of coal which was underlain with 4½ inches of bone. The sample was obtained in mine, 400 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

FORT STEELE. ABANDONED MINE.

Sample.—Bituminous coal; Hanna field; analysis No. 3508 (p. 299).

Mine.—An abandoned slope; in the NW. ¼ SW. ¼ sec. 36, T. 19 N., R. 85 W., 16 miles south of Fort Steele.

Coal bed.—Not named. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 1, 1906, by A. C. Veatch. The sample included 1 foot 4 inches of coal, which was underlain with 1 foot of bone. The sample was obtained in mine, 150 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 299; also U. S. Geol. Survey Bull. 316, p. 253.

HANNA. HANNA NO. 1 MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3605, 3606, 3607, 3608, 3609 (pp. 299, 300).

Mine.—Hanna No. 1; in the SW. ¼ NW. ¼ sec. 20, T. 22 N., R. 81 W., at Hanna, on the Union Pacific Railroad.

Coal bed.—Hanna No. 1. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled in August, 1906, by A. C. Veatch, as shown below:

Generalized section of coal bed in Hanna No. 1 mine at Hanna.

	Ft.	*in.*
Coal	1	7
Coal [a]	5	0
Coal, dirty	1	2
Coal [b] [c]	5	0
Coal [c]	2	0
Coal, dirty	5	0
Coal [c]	1	0
Coal, bony	1	4
Coal [d]	3	0
Coal, dirty	0	3
Coal [d]	1	0
Thickness of bed	21	5

[a] Included in sample 3605.
[b] Included in sample 3608.
[c] Included in sample 3609.
[d] Included in sample 3607.

Sample 3608 was taken in entry 6 on east side, 1,200 feet south of slope and represented the upper 5 feet of middle bench.

Sample 3609 was taken in entry 19 on west side and represented an 8-foot cut.

Sample 3605 was taken in entry 6 on east side, 1,200 feet south of slope, and represented a 79-inch cut from the upper 7-foot bench.

Sample 3607 represented bottom bench where it is 4 feet thick in entry 7, 725 feet from slope.

Sample 3606 was taken in entry 20, 4,000 feet south of slope and represented middle bench where it is 9 feet 4 inches thick.

For chemical analyses of this coal see part I of this bulletin, pp. 299, 300; also U. S. Geol. Survey Bull. 316, p. 255.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 250.

Hanna. Hanna No. 2 Mine.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3162 and 3163 (Wyoming No. 4), analyses Nos. 7130 and 7131 (Ann Arbor No. 7), and analyses Nos. 3160, 3161, 3610, 3611 (pp. 300, 301).

Mine.—Hanna No. 2, a slope mine in Carbon County in sec. 20, T. 22 N., R. 81 W., at Hanna, on the Union Pacific Railroad.

Coal bed.—The bed worked at this mine is known as the Hanna No. 2. Cretaceous or Tertiary age, "Upper Laramie" formation. At this mine the bed dips about 17° SE. The coal averages 34 feet thick and carries two bright bands, one about 15 and the other about 12 inches thick. There are three benches of coal, averaging 5 feet, 19 feet, and 6 feet thick. These benches are free from shale or other partings. The bed lies about 390 feet below surface. The roof and floor are coarse yellow sandstone.

The bed shows the following section:

Section of coal bed in Hanna No. 2 mine at Hanna.

	Ft.	in.
Roof, shale, overlaid with sandstone.		
Coal	5	3
Shale and bone	1	3
Coal	19	1
Bony coal	0	4
Shale	0	8
Coal	6	6
Clay	0	2½
Coal	1	0
Floor, shale underlaid with sandstone.		
Thickness of bed	34	3½

The benches were sampled at four points in the mine by J. W. Groves on April 16 and 17, 1906, as shown below.

Sample 3160 was taken in the middle bench, 18 feet 8 inches thick, in room 17, off entry 4, 1,900 feet south of the slope opening. At this point the roof of the bench is bone coal, and the floor is 7 inches of bone coal with 10 inches of shale.

Sample 3161 was taken in the top bench, 5 feet 3 inches thick, in dark entry 4, 2,000 feet south of the slope opening. The roof of the coal in this bench is a slickensided shale 4 inches thick, with sandstone above. The floor consists of layers of bone coal and shale with a total thickness of 15 inches.

Sample 3162 was taken in the bottom bench, 6 feet 6 inches thick, in room 14, off entry 4, 1,700 feet south of the slope opening. The roof of the coal in this bench is a parting shale 6 inches thick. The floor is fire clay, 2½ inches thick, below which is said to be a 1-foot bed of coal.

Sample 3163 was taken from the middle bench, 19 feet 6 inches thick, in room 14, off entry 4, 1,700 feet south of the slope opening. The roof of this bench at this point is shale. The floor is a shale 7 inches thick.

The bed was also measured and sampled at two points on December 31, 1908, by K. M. Way, as described below:

Sections of coal bed in Hanna No. 2 mine at Hanna.

Laboratory No.	7130		7131	
Roof, top coal.	*Ft.*	*in.*	*Ft.*	*in.*
Coal	0	8	5	0
Shale[a]	0	5	0	1½
Coal	4	9	3	7
Floor, shale.				
Thickness of bed	5	10	8	8½
Thickness of coal sampled	5	5	8	6

[a] Not included in sample.

Sample 7130 was taken in room 37, off entry 2, 2,500 feet southwest of opening.

Sample 7131 was taken in room 40, off entry 5, 5,000 feet southwest of opening.

The bed was also measured and sampled on August 15, 1906, by A. C. Veatch, as shown below:

Section of coal bed in Hanna No. 2 mine at Hanna.

	Ft.	*in.*
Coal	8	0
Bone	0	5
Coal[a]	8	0
Coal	8	0
Bone	0	5
Coal[b]	8	0
Thickness of bed	32	10

[a] Included in sample 3611. [b] Included in sample 3610.

Sample 3611 represented an 8-foot cut of weathered coal from the middle bench. It was taken in entry 6

Sample 3610 represented an 8-foot cut of coal from a lower bench than that from which sample 3611 was taken. The sample was obtained in room 16, off entry 4.

Notes.—The coal from this mine, like that from other mines in this field, had been used largely for locomotive supply. The capacity of the mine at time of sampling in 1908 was 1,000 tons daily.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 285; Bureau of Mines Bull. 23, pp, 70, 189; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 285; Bureau of Mines Bull. 13, pp. 224, 277; illuminating gas tests: Bureau of Mines Bull. 6, pp. 40, 47.

For chemical analyses see part I of this bulletin, pp. 300, 301; also U. S. Geol. Survey Bull. 316, p. 255; Bull 332, p. 284.

HANNA. HANNA NO. 3 MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3612, 3613, 3614 (p. 301).

Mine.—Hanna No. 3, at Hanna, in the NW. ¼ SE. ¼ sec. 18, T. 22 N., R. 81 W., on the Union Pacific Railroad.

Coal bed.—Hanna No. 1. Cretaceous or Tertiary age, "Upper Laramie" formation.

The bed was measured and sampled on August 17, 1906, by A. C. Veatch. The samples were taken from middle bench of coal bed 19 to 40 feet thick.

Sample 3612 was obtained in entry No. 1, 1,500 feet from mouth of mine where the middle bench was 7 feet 6 inches thick.

Sample 3613 was obtained in entry 4, 1,000 feet from the mouth of mine where the middle bench was 6 feet 2 inches thick.

Sample 3614 was obtained in entry 4, 1,410 feet from mouth of mine where the middle bench was 7 feet 3 inches of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3617 (p. 301).

Location.—Prospect; in sec. 18, T. 22 N., R. 81 W., ½ mile north of Hanna.

Coal bed.—No name. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 17, 1906, by A. C. Veatch, as shown below:

Section of middle bench of coal bed in prospect, ½ mile north of Hanna.

Laboratory No	3617	
	Ft.	*in.*
Coal [a]	8	0
Shale [a]	0	8
Coal	7	0
Thickness of bed	15	8
Thickness of coal sampled	7	0

[a] Not included in sample.

The sample was taken 40 feet in. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3615 (p. 301).

Location.—Prospect; in the SW. ¼ sec. 17, T. 22 N., R. 81 W., 1 mile northeast of Hanna.

Coal bed.—No name (bed between Nos. 1 and 2). Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 18, 1906, by A. C. Veatch. The sample included 5 feet of coal, under which was 1 foot of bone. The sample was taken in main entry, 140 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3616 (p. 301).

Location.—Prospect in the SE. ¼ NW. ¼ sec. 24, T. 22 N., R. 82 W., 1 mile southwest of Hanna.

Coal bed.—No name (first bed below Hanna bed). Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on August 16, 1906, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 1 mile southwest of Hanna.

Laboratory No	3616	
	Ft.	*in.*
Coal	1	0
Shale [a]	0	3
Coal	2	6
Thickness of bed	3	9
Thickness of coal sampled	3	6

[a] Excluded from sample.

The sample was taken in main entry, 40 feet from mine mouth. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3822 (p. 301).

Location.—Prospect in the NW. ¼ NW. ¼ sec. 31, T. 23 N., R. 81 W., 4 miles north of Hanna.

Coal bed.—No name. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on September 12, 1906, by Max A. Pishel. The sample included 5 feet of clear coal. The sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3929 (p. 301).

Location.—Prospect; in the NE. ¼ NW. ¼ sec. 2, T. 22 N., R. 85 W., 8 miles north of Hanna and about 15 miles northeast of Rawlins.

Coal bed.—No name. Cretaceous age, "Lower Laramie" formation.

The bed was measured and sampled in 1906 by A. C. Veatch. The sample included 3 feet 8 inches of clear coal. The sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, pp. 249, 254.

HANNA. ROCK CROSSING MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3779, 3781 (p. 301).

Mine.—Rock Crossing; on Medicine Bow River, in the NE. ¼ SE. ¼ sec. 33, T. 24 N., R. 81 W., 10 miles north of Hanna.

Coal bed.—No name. Cretaceous or Tertiary age, "Upper Laramie" formation.

The bed was measured and sampled on September 15, 1906, by A. C. Veatch, as shown below:

Section of coal bed in Rock Crossing mine, 10 miles north of Hanna.

Laboratory No.	3779, 3781	
	Ft.	*in.*
Coal	2	6
Shale [a]	0	2
Coal	0	7
Coal, dirty	0	6
Shale [a]	0	2
Coal	0	6
Thickness of bed	4	5
Thickness of coal sampled	4	1

[a] Excluded from sample.

Both samples were taken in a room 80 feet from the mouth of mine, but sample 3779 was taken in southeast corner of room, about 75 feet south of where No. 3781 was taken. No. 3781 was taken in northeast corner of the room. Mine had not been worked for some time, and the coal was probably slightly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 250.

HANNA. COULTER MINE.

Sample.—Subbituminous coal; Hanna field; analysis No. 3780 (p. 301).

Mine.—Coulter; in sec. 35, T. 24 N., R. 81 W., about 11 miles northeast of Hanna.

Coal bed.—No name. Cretaceous or Tertiary age, "Upper Laramie" formation.

The bed was measured and sampled on September 5, 1906, by A. C. Veatch, as shown below:

Section of coal bed in Coulter mine, 11 miles northeast of Hanna.

Laboratory No.	3780	
	Ft.	in.
Coal	1	6
Shale[a]	0	4
Coal	0	11
Dirt[a]	0	½
Coal	1	7
Thickness of bed	4	4½
Thickness of coal sampled	4	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 255.

HANNA. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3790 (p. 301).

Location.—Prospect; in the SW. ¼ NE. ¼ sec. 11, T. 24 N., R. 83 W., 16 miles northwest of Hanna, Carbon County.

Coal bed.—No name. Cretaceous age, "Lower Laramie" formation.

The bed was measured and sampled in 1906 by A. C. Veatch, as shown below:

Section of coal bed in prospect, 16 miles northwest of Hanna.

Laboratory No.	3790	
	Ft.	in.
Coal	4	3
Shale[a]	0	½
Coal	1	2
Thickness of bed	5	5½
Thickness of coal sampled	5	5

[a] Not included in sample.

The sample was obtained in mine, 40 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

IRON. KRONKHEIT MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3920, 3922 (p. 301).

Mine.—Kronkheit; in the NW. ¼ SW. ¼ sec. 17, T. 25 N., R. 85 W., 1 mile southeast of Iron and about 30 miles northwest of Hanna.

Coal beds.—Upper and Lower. Cretaceous age, "Lower Laramie" formation.

The beds were measured and sampled on October 1, 1906, by A. C. Veatch. Sample 3920 included 6 feet 6 inches of coal, which was overlain with 2 feet of coal. The sample was taken from the Upper bed.

Sample 3922 included 8 feet of coal. It was taken in the Lower bed, in the main entry of the mine, 240 feet from mouth.

For chemical analyses of this coal see part I of this bulletin, p. 301; also U. S. Geol. Survey Bull. 316, p. 254.

IRON. BURLINGTON PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3916 (p. 302).

Location.—Burlington prospect; in the NW. ¼ SE. ¼ sec. 20, T. 25 N., R. 85 W., 1½ miles southeast of Iron, and about 29 miles northwest of Hanna.

Coal bed.—No name. Cretaceous age, Lewis formation.

The bed was measured and sampled on October 2, 1906, by A. C. Veatch. The sample included 5 feet 3 inches of clear coal, weathered.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 254.

IRON. PENN-WYOMING MINE.

Sample.—Subbituminous coal; Hanna field; analysis No. 3919 (p. 302).

Mine.—Penn-Wyoming; in the SW. ¼ SE. ¼ sec. 20, T. 25 N., R. 85 W., 2 miles southeast of Iron and about 29 miles northwest of Hanna.

Coal bed.—No name. Cretaceous age; Lewis formation. The bed was measured and sampled on October 6, 1906, by A. C. Veatch. The sample included 4 feet 10 inches of clear coal. It was obtained in main entry, 200 feet from mouth of mine.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

IRON. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3923 (p. 302).

Location.—Prospect; in the NW. ¼ NW. ¼ sec. 20, T. 25 N., R. 85 W., 2½ miles southeast of Iron and about 29 miles northwest of Hanna.

Coal bed.—No name. Cretaceous age; Lewis formation.

The bed was measured and sampled on October 2, 1906, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 2½ miles southeast of Iron.

Laboratory No.	3923	
	Ft.	*in.*
Coal	3	6
Shale [a]	0	1
Coal	1	3
Thickness of bed	4	10
Thickness of coal sampled	4	9

[a] Not included in sample.

The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

IRON. FIELDHOUSE PROSPECT.

Sample.—Bituminous (?) coal; Hanna field; analysis No. 3925 (p. 302).

Mine.—Fieldhouse prospect, in the SE. ¼ NE. ¼ sec. 23, T. 25 N., R. 86 W., 3½ miles southwest of Iron.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on October 10, 1906, by Max W. Ball, as shown below:

Section of coal bed in Fieldhouse prospect, 3½ miles southwest of Iron.

Laboratory No.	3925	
	Ft.	*in.*
Coal	0	8
Shale [a]	0	1
Coal	3	6
Coal, dirty [a]	3	8
Thickness of bed	7	11
Thickness of coal sampled	4	2

[a] Excluded from sample.

The sample was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 253; Bull. 341, p. 237.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 248.

Iron. Miller Mine.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3915, 3917, 3918 (p. 302).

Mine.—Miller; in the NE. ¼ SW. ¼ sec. 35, T. 25 N., R. 85 W., 6 miles southeast of Iron.

Coal bed.—No name. Cretaceous age: Lewis formation.

The bed was measured and sampled on October 1, 1906, by Max A. Pishel, as shown below:

Sections of coal bed in Miller mine, 6 miles southeast of Iron.

Laboratory No.	3917,3918		3915	
	Ft.	*in.*	*Ft.*	*in.*
Coal	4	0	2	6
Coal, bony	1	0	..	..
Bone	..	..	[a]2	0
Coal	6	6	..	..
Thickness of bed	11	6	4	6
Thickness of coal sampled	..	..	2	6

[a] Not included in sample.

Sample 3917 represented the entire bed (10½-foot cut) except the bony coal, and was taken 80 feet from the foot of the shaft.

Sample 3918 represented the lower bench (6½-foot cut), and was taken 40 feet from the foot of the shaft.

Sample 3915 was collected 300 feet higher in the series than samples 3918 and 3917.

Note.—This mine consisted of a shaft 120 feet deep.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 253.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 253.

Iron. O'Brien Springs Opening.

Sample.—Bituminous (?) coal; Carbon field; analysis No. 3921 (p. 302).

Location.—O'Brien Springs opening; 7½ miles southeast of Iron and 23 miles north of Fort Steele, in NE. ¼ SW. ¼ sec. 9, T. 24 N., R. 85 W.

Coal bed.—The bed is of Cretaceous age; Mesaverde formation. Dip 36° S. 20° E.

The bed was measured and sampled on October 1, 1906, by A. C. Veatch, as shown below:

Section of coal bed in O'Brien Springs opening, 7½ miles southeast of Iron.

Laboratory No.	3921	
Roof, sandstone.	*Ft.*	*in.*
Dirty coal	0	5
Sandstone[a]	0	8
Coal	1	3
Bone[a]	0	3
Coal	0	8
Dirty coal[a]	0	8
Coal	0	10
Thickness of bed	4	9
Thickness of coal sampled	3	2

[a] Not included in sample.

The sample was taken 40 feet in from opening.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 256.

IRON. BURLINGTON PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis Nos. 3926, 3928 (p. 302).

Location.—Burlington prospect; in the NE. ¼ NW. ¼ sec. 26, T. 24 N., R. 86 W., 10 miles south of Iron.

Coal bed.—No name. Cretaceous age; Lewis formation.

The bed was measured and sampled in 1906 by A. C. Veatch, as shown below:

Generalized section of coal bed in Burlington prospect, 10 miles south of Iron.

	Ft.	*in.*
Coal	4	8
Parting	0	5
Coal	5	2
Thickness of bed	10	3

Sample 3926 included the lower 62 inches and sample 3928 the upper 4⅔ feet. Both samples were taken 20 feet in and consisted of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 302; also U. S. Geol. Survey Bull. 316, p. 253.

IRON. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analysis No. 3930 (p. 303).

Location.—Prospect in the SW. ¼ SE. ¼ sec. 26, T. 24 N., R. 86 W., 10 miles south of Iron.

Coal bed.—No name. Cretaceous age; Lewis formation.

The bed was measured and sampled in 1906 by A. C. Veatch. The sample included 5 feet 8 inches of coal, under which was 4 feet 4 inches of coal not included in sample. The sample was taken 25 feet from mouth of slope.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 253.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

IRON. PROSPECT.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3807 and 3824 (p. 303).

Location.—Prospect; in the NW. ¼ NW. ¼ sec. 7, T. 24 N., R. 83 W., 14 miles southeast of Iron and about 22 miles northwest of Hanna.

Coal bed.—No name. Cretaceous age; "Lower Laramie" formation.

The bed was measured and sampled at one point on September 18, 1906, by A. C. Veatch, as shown below:

Section of coal bed in prospect, 14 miles southeast of Iron.

	Ft.	*in.*
Coal [a]	4	4
Shale	1	6
Sandstone	1	2
Coal [b]	4	8
Thickness of bed	11	8

[a] Included in sample 3824.

[b] Included in sample 3807.

Both samples weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. . 16, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

IRON. OLD SPEYER MINE.

Sample.—Subbituminous coal; Great Divide Basin field; analysis No. 5818 (p. 303).

Mine.—Old Speyer (abandoned); in the SW. ¼ NW. ¼ sec. 8, T. 27 N., R. 89 W., 27 miles northwest of Iron.

Coal bed.—No name. Cretaceous age; "Laramie" formation.

The bed was measured and sampled in 1907 by E. E. Smith. The sample included 4½ feet of coal, over which was 7½ feet of coal not included. The sample was obtained in mine, 96 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey. Bull. 341, p. 237.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 233.

RAWLINS. DILLON MINE.

Sample.—Bituminous coal; Hanna field; analyses Nos. 3477, 3478, 5297 (p. 303).

Mine.—Dillon; in the NE. ¼ NW. ¼ sec. 36, T. 21 N., R. 88 W., 3 miles southwest of Rawlins.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled at two points on July 26, 1906, by A. C. Veatch, and at one point in July, 1907, by M. W. Ball, as shown below:

Sections of coal bed in Old Dillon mine, 3 miles southwest of Rawlins.

Laboratory No.	3477		3478	
	Ft.	in.	Ft.	in.
Coal	3	0	2	10
Coal, dirty [a]	0	2	0	2
Coal	1	10	1	6
Thickness of bed	5	0	4	6
Thickness of coal sampled	4	10	4	4

[a] Not included in sample.

Sample 3477 was taken in room 2, 360 feet from entrance.

Sample 3478 was taken in room 1, 300 feet from entrance.

Sample 5297 was taken from the new entry in a room 30 feet in on the first drift turning to the left. The sample represented the whole of a 4½-foot bed.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 253.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 248.

RAWLINS. PROSPECT.

Sample.—Bituminous (?) coal; Hanna field; analysis No. 3479 (p. 303).

Location.—Prospect in the SE. ¼ SE. ¼ sec. 13, T. 20 N., R. 87 W., 7 miles southeast of Rawlins.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on July 26, 1906, by A. C. Veatch. The sample included 4 feet 6 inches of coal. It was obtained near surface. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 253.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 248.

RAWLINS. NEBRASKA MINE.

Sample.—Subbituminous coal; Little Snake River field; analysis No. 5324 (p. 303).

Mine.—Nebraska; 8 miles southeast of Rawlins, in the NE. ¼ SW. ¼ sec. 6, T. 20 N., R. 88 W.

Coal bed.—The coal bed is a local one of Cretaceous age; "Laramie" formation. The bed had not been traced for any great distance.

The bed was measured and sampled by M. W. Ball in July, 1907, as shown below:

Section of coal bed in Nebraska mine, 8 miles southwest of Rawlins.

Laboratory No	5324	
	Ft.	*in.*
Coal, firm	4	0
Coal, slightly crumbly	1	6
Coal	2	0
Coal, crumbly	0	6
Thickness of bed	8	0
Thickness of coal sampled	8	0

The sample was taken 180 feet in on right wall of main entry.

Notes.—The coal was mined only for local use at Rawlins.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 341, p. 251.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 245.

RAWLINS. PROSPECT.

Sample.—Subbituminous (?) coal; Great Divide Basin; analysis No. 5815 (p. 303).

Location.—Prospect; in the SW. ¼ SW. ¼ sec. 12, T. 21 N., R. 89 W., 8 miles west of Rawlins.

Coal bed.—No name. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled in 1907 by E. E. Smith. The sample was taken from a 6-foot cut made near the surface. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 341, p. 238.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 234.

RAWLINS. ROBERTSON MINE.

Sample.—Bituminous coal; Little Snake River field; analysis No. 5340 (p. 303).

Mine.—Robertson; in the SE. ¼ sec. 4, T. 17 N., R. 90 W., 1¼ miles east of Sulphur Stage station, and 27 miles southwest of Rawlins.

Coal bed.—The coal is of Cretaceous age, Mesaverde formation. Roof, shaly sandstone.

The bed was measured and sampled by M. W. Ball in August, 1907; the sample included 8 feet of coal cut from the lower part of a coal stratum 11 feet thick. The floor was not exposed but was seemingly shaly. The sample was taken in the far face of chamber, 100 feet west of opening.

Note.—The coal is bituminous and is supposed to be noncoking.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 341, p. 251.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 245.

WALCOTT. BUCKLEY AND RYAN MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3538, 3544 (p. 303).

Mine.—Buckley and Ryan; in the SE. ¼ SW. ¼ sec. 14, T. 21 N., R. 84 W., about 20 miles east of Rawlins and 2½ miles north of Walcott.

Coal bed.—The coal is of Cretaceous age, "Lower Laramie" formation.

The bed was measured and sampled on August 9, 1906, by A. C. Veatch. The samples included 4 feet of coal, over which was 8 inches of dirty coal.

Sample 3538 was taken in mine, 290 feet northeast of mouth of slope.

Sample 3544 was taken in mine, 375 feet from entrance, in entry 5.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

WALCOTT. PROSPECT.

Sample.—Subbituminous coal; Hanna field, analysis No. 3548 (p. 303).

Mine.—Prospect; in the NW. ¼ SE. ¼ sec. 1, T. 20 N., R. 83 W., 8 miles southeast of Walcott, and about 22 miles southwest of Hanna.

Coal bed.—The coal is of Cretaceous age; "Lower Laramie" formation.

The bed was measured and sampled on August 10, 1906, by A. C. Veatch. The sample included 7¼ feet of coal, over which was 1¾ feet of dirty coal not included in the sample. The sample was obtained near the mouth of slope and was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 254.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 249.

WALCOTT. ABANDONED MINE.

Sample.—Subbituminous coal; Hanna field; analyses Nos. 3806, 3826 (p. 303).

Mine.—Abandoned mine; in the SE. ¼ SW. ¼ sec. 25, T. 23 N., R. 84 W., 12 miles north of Walcott and ½ mile east of Platte River.

Coal bed.—No name. Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on September 24, 1906, by A. C. Veatch. The measurement showed the coal to contain 7 feet of clear coal.

Sample 3806 was taken in mine, 80 feet from entrance. The coal was weathered.

Sample 3826 was taken in mine, 374 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 303; also U. S. Geol. Survey Bull. 316, p. 255.

WALCOTT. ABANDONED MINE.

Sample.—Subbituminous coal; Hanna field; analysis No. 3808 (p. 304).

Mine.—Abandoned mine; in the NW. ¼ SW. ¼ sec. 25, T. 23 N., R. 84 W., about 12½ miles north of Walcott.

Coal bed.—The coal is of Cretaceous or Tertiary age; "Upper Laramie" formation.

The bed was measured and sampled on September 24, 1906, by A. C. Veatch. The measurement showed the bed to be 7½ feet of coal. The sample was taken in main entry, 130 feet from mouth of mine. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 316, p. 255.

CONVERSE COUNTY.

BIG MUDDY. COLE CREEK MINE.

Sample.—Subbituminous coal: Glenrock field; analyses Nos. 5325, 5326 (p. 304).

Mine.—Cole Creek; a slope mine, in sec. 25, T. 34 N., R. 77 W., 2 miles north of Big Muddy, on a spur of the Chicago & Northwestern Railroad.

Coal bed.—Coal bed is one of two lower beds of the Glenrock-Big Muddy group, of coals and is near the base of the Fort Union formation; Tertiary age. The dip is 5° or 6° N. Thickness is fairly uniform.

The bed was measured and sampled at two points by C. T. Lupton on September 11, 1907.

Sample 5325 included 3½ feet of clear coal. It was taken from the lower bed 650 feet from the mine opening.

Sample 5326 included 4⅔ feet of clear coal. It was taken from the upper bed, 960 feet from mine opening.

Notes.—Little is being done with the coal in the Glenrock field because of the scarcity of thick beds; the cost of mining, due to thinness of bed, the price of labor and timber, poor roofs, and presence of water, is high; and inability to utilize the coal as locomotive fuel. In 1907 much more than half of the product went to Nebraska, where it was used as steam and domestic fuel.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

Big Muddy. Outcrop.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5422 (p. 304).

Location.—Outcrop; 14 miles north of Big Muddy, in sec. 36, T. 36 N., R. 77 W.

Coal bed.—The coal is of Fort Union formation; Tertiary age. Probably a local lens, but belongs in the group of beds which carry several persistent coals. Roof, shale; floor, shaly clay. The bed was measured and sampled by E. W. Shaw on September 25, 1907. The sample included 2½ feet of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

Douglas. Prospect.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5318 (p. 304).

Mine.—Prospect; 1½ miles west of Douglas, in sec. 7, T. 32 N., R. 71 W., near the Chicago & Northwestern Railroad.

Coal bed.—It is in the lower part of the Inez group of coals which have been worked at Inez. The coal is of Tertiary age; Fort Union formation. Thickness, variable, but persistent. It dips 5° to 10° NE. The roof is of shale and the floor of soft clay. Thickness of bed, 22 inches.

The bed was sampled and measured by E. W. Shaw on September 11, 1907. The sample was taken 70 feet from the mouth of the prospect. It included 22 inches of weathered coal.

Notes.—The prospect was worked in winter, a small amount of coal being taken out for domestic purposes. The coal is subbituminous and slacks readily on exposure. It was mined extensively at Inez for a short time. The beds are there 6 to 8 feet thick, but the mines had been abandoned and the land sold for agricultural purposes.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

Douglas. Prospect.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5321 (p. 304).

Location.—Prospect; in sec. 27, T. 33, R. 72 W., 6 miles northwest of Douglas, about 3 miles south of the Chicago & Northwestern Railway.

Coal bed.—La Preh, the lower bed of the Inez group of coals. Fort Union formation; Tertiary age. The thickness is somewhat variable, but the bed is persistent and dips here 5° to 8° NE.

The bed was measured and sampled by E. W. Shaw on September 12, 1907. The sample was taken about 70 feet northeast of the opening, and included 1¾ feet of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

Glenrock. Glenrock No. 1 Mine.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5330 (p. 304).

Mine.—Glenrock No. 1; a slope mine at Glenrock, in sec. 4, T. 33 N., R. 75 W., on the Chicago & Northwestern Railroad.

Coal bed.—Glenrock; Big Muddy group of coals of Fort Union formation; Tertiary age. The thickness is fairly uniform. The dip is 3° or 4° NE. The roof is of sandstone, and the floor of clay.

The bed was measured and sampled 2,600 feet north and 50 degrees east of the opening by E. W. Shaw on September 13, 1907. The sample included 5 feet 6 inches of clear coal.

Notes.—The coal produced at Glenrock and Big Muddy is the best in the Glenrock field. It is subbituminous but of high quality for that class.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

GLENROCK. GLENROCK NO. 2 MINE.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5322 (p. 304).

Mine.—Glenrock No. 2; ½ mile southeast of Glenrock, in sec. 4, T. 33 N., R. 75 W., on the Chicago & Northwestern Railway.

Coal bed.—Glenrock. Tertiary age; Fort Union formation. The thickness is fairly uniform and the dip is 3° or 4° NE. The roof is of heavy, bedded sandstone and floor of sandy clay.

The bed was measured and sampled 1,100 feet and 80 degrees east of the opening by E. W. Shaw on September 12, 1907. The sample included 6 feet of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

GLENROCK. PROSPECT.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5320 (p.304).

Location.—An abandoned prospect, 4 miles southwest of Glenrock, in sec. 12, T. 33 N., R. 76 W.

Coal bed.—The coal is of Cretaceous age; Montana formation; probably a local lens. Dip, 7° or 8° NE. Roof, sandstone.

The bed was measured and sampled by E. W. Shaw on September 11, 1907. The sample included 3 feet of weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

GLENROCK. SURFACE OUTCROP.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5317 (p. 304).

Location.—Surface outcrop; 25 miles northwest of Douglas, in sec. 30, T. 36 N., R. 75 W., 16½ miles from the railroad and 14 miles north of Glenrock.

Coal bed.—This is one of the upper beds of the Inez group of coals. Tertiary age; Fort Union formation. It is in places 5 or 6 or more feet thick, but is absent in many places. The dip is 2° or 3° NE.

The bed was measured and sampled by R. A. Branson on September 11, 1907. The sample included 4 feet 2 inches of clear coal, weathered.

For chemical analyses of this coal see part I of this bulletin, p. 304; also U. S. Geol. Survey Bull. 341, p. 162.

CROOK COUNTY.

ALADDIN. STILWELL MINE.

Sample.—Bituminous coal; Black Hills region; (Wyoming No. 3) analyses Nos. 1976 and 1977 and analyses Nos. 9320 and 9321 (p. 305).

Mine.—Stilwell; at Aladdin, on the Wyoming & Missouri River Railroad.

Coal bed.—At base of Lakota sandstone, Lower Cretaceous age.

The bed was measured and sampled on August 10, 1905, by M. R. Campbell. Sample 1976 was taken in room 1, off entry 4, or east entry 2 in new works, 750 feet from the mouth of the mine, where the bed measured 3 feet 9½ inches in thickness. Sample 1977 was taken from the face of entry 2, 850 feet from the mouth of the mine, where the bed was 3 feet 2 inches thick.

The bed was also measured and sampled by R. W. Stone on June 29, 1909. Sample 9320 included 23 inches of bituminous coal, and sample 9321 included 23 inches of splint coal underlying the coal included in sample 9320.

Notes.—At time of sampling in 1909 this mine had been driven about 1,300 feet north, down a 3° to 7° dip. The inner half of the drift was caved and samples 9320 and 9321 were taken 700 feet from the entry at a fresh working face. They were contained in Mason glass fruit-jars (sealed with rubber washers) from June 29 until November, 1909, when they were transferred to regular coal-sample cans and were sealed with wax. Judged by agate-mortar test, sample 9320 represented a coking coal and sample 9321 represented a noncoking, bituminous coal. A car sample of run-of-mine coal sent to the St. Louis testing plant produced no coke.

For results of tests of this coal, see mention of specific tests as follow—steaming tests: U. S. Geol. Survey Bull. 290, p. 227; Bureau of Mines Bull 23, pp. 70, 188; producer-gas tests: U. S. Geol. Survey Bull. 290, p. 228; Bureau of Mines Bull. 13, pp. 224, 228; washing tests: U. S. Geol. Survey Bull. 290, p. 229; coking tests: U. S. Geol. Survey Bull. 290, p. 229.

For chemical analyses see part I of this bulletin, p. 305; also U. S. Geol. Survey Bull. 290, p. 227.

CROTON. CROTON MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 6432 (p. 305).

Mine.—Croton; in the NE. ¼ sec. 2, T. 52 N., R. 76 W., at Croton, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Felix. Tertiary age; Fort Union formation. The bed has a total thickness of 11 feet of subbituminous coal.

The bed was measured and sampled by C. T. Lupton, in September, 1908. The sample included 6 feet of coal, over which was 5 feet of coal not included in the sample. The sample was taken 120 feet from entrance.

Notes.—A single entry had been driven about 120 feet but no mining had been done for several years.

For chemical analyses of this coal see part I of this bulletin, p. 305.

ECHETA. ECHETA MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 6448 (p. 305).

Location.—Old entry in draw ¼ mile south of Echeta, in the NW. ¼ NE. ¼ sec. 28, T. 52 N., R. 75 W., on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Felix. Tertiary age; Fort Union formation. The bed at Echeta consists of 30 feet of clean solid subbituminous coal.

The bed was measured and sampled by R. W. Stone, in September, 1908. The sample was taken from an 8-foot cut near the middle of a 30-foot bed.

Notes.—The entry from which the sample was taken had been driven a number of years previously in the middle of the bed, and was about 60 feet long. The sample was taken 15 feet from the face of this entry and although the surface was cleaned to remove all checked coal, the sample was probably more or less weathered by its long exposure to the air.

For chemical analyses of this coal see part I of this bulletin, p. 305.

GILLETTE. BARKER MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 6542 (p. 305).

Mine.—Barker; in the SW. ¼ sec. 17, T. 50 N., R. 72 W., 1 mile west of the Chicago, Burlington & Quincy Railroad at Gillette.

Coal bed.—Felix. Tertiary age; Fort Union formation.

The bed was measured and sampled by R. W. Stone, in September, 1908. The bed is in slightly consolidated shales and sands and has the following section:

Section of coal bed in Barker mine, 1 mile west of Gillette.

Laboratory No	6542	
	Ft.	*in.*
Coal	13	0
Shale, carbonaceous	4	0
Coal	9	0
Thickness of bed	26	0

The sample was taken from a 7-foot cut made at a working face 150 feet in, from the lower part of the upper 13-foot bench of coal.

Notes.—The mine is a single drift in the lower portion of the upper bench. As coal was mined here throughout the year the sample represents fairly fresh coal of the better part of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 305.

GILLETTE. HULBERT MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 6602 (p. 305).

Mine.—Hulbert open pit mine; in the NE. ¼ sec. 10, T. 51 N., R. 72 W., 9 miles north of Gillette, Crook County, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—This bed is probably the Lower Ulm, Tertiary age; Fort Union formation. It carries, at the point of sampling, 22 feet of clean, subbituminous coal overlain with 6 feet of coal and shale.

The bed was measured and sampled by C. T. Lupton in September, 1908. The sample was from a part of the bed but as there is no apparent difference throughout the entire 22 feet the sample is presumed to be fairly representative of the entire thickness. The coal was weathered.

Notes.—Coal is taken from this mine at short intervals, so the face from which the sample was taken, although exposed to the open air, was not badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 305.

OXUS. KENDRICK PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5402 (p. 305).

Location.—Prospect of J. B. Kendrick on Powder River in sec. 21, T. 57 N., R. 76 W., 5 miles southwest of Oxus.

Coal bed.—Powder River. Tertiary age; Fort Union formation.

The bed was measured and sampled in 1907 by Joseph A. Taff, as shown below:

Section of coal bed in Kendrick prospect, 5 miles southeast of Oxus.

Laboratory No	5402	
	Ft.	*in.*
Coal	4	0
Shale [a]	0	6
Coal	5	4
Shale [a]	0	8
Coal [a]	22	4
Shale [a]		
Thickness of bed	32	10
Thickness of coal sampled	9	4

[a] Not included in sample.

The coal included in the sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 305; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, pp. 126, 143.

ROCKEFELLER RANCH. PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 9219 (p. 305).

Location.—Prospect; 1 mile east of Rockefeller ranch, on south side of Elk Creek, in T. 56 N., R. 72 W., Crook County.

Coal bed.—Rockefeller. It is of Tertiary age; Fort Union formation. Nothing definite can be said regarding the uniformity of the thickness of the bed, as it was examined only at this place on a reconnaissance trip. The roof is a gray and dark-drab shale, and probably would require considerable propping. The floor is a yellowish sandstone.

The bed was measured and sampled by Charles T. Lupton and Henry Hinds on October 18, 1909, as shown below:

Section of coal bed in prospect, 1 mile east of Rockefeller ranch.

Laboratory No	9219	
Main roof, shale, gray and dark drab.	*Ft.*	*in.*
Coal[a]	1	6
Shale, carbonaceous[a]	1	2
Coal[a]	9	11
Coal	7	0
Floor, yellowish sandstone.		
Thickness of bed	19	7
Thickness of coal sampled	7	0

[a] Not included in sample.

Notes.—The coal was slightly weathered but dry. Ranchers nearby obtained their fuel supply from this prospect. Only the lower 7 feet of this bed was sampled.

For chemical analyses of this coal see part I of this bulletin, p. 305.

FREMONT COUNTY.

HUDSON. INDIAN MINE.

Sample.—Subbituminous coal; Hudson field of the Wind River coal region; analysis No. 6712 (p. 305).

Mine.—Indian; in sec. 2, T. 2 S., R. 2 E., west of Hudson, Fremont County. The mine is located within the Shoshone Indian Reservation and is reached by a spur of the Wyoming & Northwestern Railroad, Chicago & Northwestern system.

Coal bed.—The bed from which the sample was taken has not been designated by name chiefly because the beds in this region are lenticular. This individual bed, however, was found to be somewhat exceptional in this particular, and was traced from the Indian mine for a distance of 5 miles to the southeast. The mine is situated on the edge of a small syncline which rises sharply to the southwest. At the point where the sample was taken the beds were found to dip 14°. Roof, hard drab shale; floor, shale.

The bed was measured and sampled by E. G. Woodruff in 1908.

The sample included 7 feet 2 inches of coal, and was taken 600 feet down slope in west entry 3. The entire bed was included in the sample taken, no impurities being excluded from the sample. The mine was in operation at the time and a sample was procured from a fresh face. At the point where the sample was taken the bed is under sufficient cover to protect it from atmospheric weathering; hence, it is believed that the analysis is representative of the subbituminous coal in this field.

Notes.—The operator was producing coal commercially for the general market in Wyoming and Nebraska along the line of the Wyoming & Northwestern Railroad. The quantity of coal produced varied greatly with the season. Since the coal is a variety that will not stock, the coal of the mine was taken out chiefly in the winter, when 20 cars a day were shipped.

For chemical analyses of this coal see part I of this bulletin, p. 305.

HUDSON. WYOMING CENTRAL MINE.

Sample.—Subbituminous coal; Hudson field of the Wind River region; analysis No. 6711 (p. 305).

Mine.—Wyoming Central; in sec. 28, T. 34 N., R. 98 W.; 1 mile south of Hudson. It is a drift mine which had been opened and then allowed to cave in, but had recently been reopened, the entry extending beyond the old workings, and at the time of sampling was yielding unweathered coal.

The bed was measured and sampled by E. G. Woodruff in 1908.

The sample included 63 inches of coal, and was taken in room 1, south entry 2, about 500 feet from the mouth of the mine. The mine was wet at the time of sampling; hence, the coal as received probably contained an abnormal amount of moisture. Water in mine was derived from an irrigation ditch which ran immediately above the entry. The mine roof is drab shale and the floor is carbonaceous shale.

Notes.—The mine was not equipped with railroad shipping facilities; hence, the larger part of the product was sold on the local market which was reached by wagon haulage. A small quantity was shipped from Hudson to which point the coal was hauled in wagons and there loaded on the cars.

For chemical analyses of this coal see part I of this bulletin, p. 305.

HUDSON. MITCHELL MINE.

Sample.—Subbituminous coal; Hudson field, Wind River region; analysis No. 9773 (p. 305).

Mine.—Mitchell; a drift mine, about 240 feet deep at the time of sampling, with one room turned off from the main entry near the end of the incline. The mine is situated in the Shoshone Indian Reservation, sec. 22, T. 1 S., R. 2 E., 5 miles northwest of Hudson.

Coal bed.—The coal bed has not been designated by name chiefly because most of the beds in this region are lenticular. It occurs in the Mesaverde formation, Cretaceous age, and at approximately the same horizon as the coal bed mined by the same operator 2 miles to the southeast. The beds dip gently to the northeast at an angle of 15°.

The bed was measured and sampled in July, 1908, by E. G. Woodruff, as shown below:

Section of coal bed in Mitchell mine, 5 miles northwest of Hudson.

Laboratory No.	9773	
Roof, sandy shale.	*Ft.*	*in.*
Coal	0	4
Shale [a]	0	½
Coal	0	9
Shale [a]	0	½
Coal	2	5
Floor, shale.		
Thickness of bed	3	7
Thickness of coal sampled	3	6

[a] Not included in sample.

The sample was taken in room 1, 240 feet from the mine entrance.

Notes.—A small amount of development work was being done at the time of sampling. The face sampled had been exposed for several months; hence the face was cleaned as thoroughly as possible before the sample was taken. The point from which the samplewas taken is under sufficient cover so that previous to opening the mine, the coal had probably not suffered from weathering. The coal from the mine had been produced chiefly for development work and was sold locally only.

For chemical analyses of this coal see part I of this bulletin, p. 305.

LANDER. BIG MINE.

Sample.—Subbituminous coal; Lander field; analysis No. 4354 (p. 305).

Mine.—Big. A slope mine in the NW. ¼ SW. ¼ sec. 3, T. 33 N., R. 98 W., 5 miles northeast of Lander, on the Chicago & Northwestern Railway.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 19, 1906, by N. H. Darton. The sample included 8 feet of coal, and was obtained in mine, 500 feet from entrance.

Notes.—The mine was worked entirely by hand. The room-and-pillar method of mining was used. The roof is a sandy shale, which requires little timbering.

For chemical analyses of this coal see part I of this bulletin, p. 305; also U. S. Geol. Survey Bull. 316, p. 243.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 242.

LANDER. LITTLE MINE.

Sample.—Subbituminous coal; Lander field; analysis No. 4355 (p. 306).

Mine.—Little; in the SW. ¼ SE. ¼ sec. 33, T. 34 N., R. 98 W., 6 miles northeast of Lander.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 19, 1906, by N. H. Darton. The sample included 4 feet of clear coal. It was obtained in southwest drift 500 feet from entrance.

Notes.—There is a 500-foot incline, with numerous rooms. In places in this mine the dip increases to 16°.

For chemical analyses of this coal see part I of this bulletin, p. 306; also U. S. Geol. Survey Bull. 316, p. 243.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 242.

LIBERTY. PROSPECT.

Sample.—Subbituminous coal; Muddy Creek field, Wind River region; analysis No. 9131 (p. 306).

Location.—Small prospect; in sec. 34, T. 6 N., R. 2 E., 8 miles southwest of Liberty, and about 35 miles northwest of Riverton.

Coal bed.—The bed is Cretaceous age; Mesaverde formation. The prospect was only about 12 feet deep on a bed which dips 7° SE. Roof, shale; floor, carbonaceous shale.

The bed was measured and sampled by E. G. Woodruff in June, 1909. The sample included 3 feet 2 inches of coal. It was taken at the end of the prospect where the coal was still somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 306.

LIBERTY. LE CLAIR MINE.

Sample.—Subbituminous coal; Muddy Creek field, Wind River region; analysis No. 6706 (p. 306).

Mine.—Le Clair; sec. 30, T. 6 N., R. 2 E., 8½ miles southwest of Liberty, Fremont County.

Coal bed.—The bed is Cretaceous age; Mesaverde formation. Very lenticular in character. Dip, about 60° SW.

The bed was measured and sampled by E. G. Woodruff in 1908, as described below:

Section of coal bed in Le Clair mine, 8½ miles southwest of Liberty.

Laboratory No	6706	
Roof, sandstone.	*Ft.*	*in.*
Coal	4	7
Shale, sandy[a]	1	5
Coal	1	6
Floor, shale.		
Thickness of bed	7	6
Thickness of coal sampled	6	1

[a] Not included in sample.

The sample was taken at the end of slope about 50 feet deep.

Note.—The mine was not in operation at the time of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 306.

LIBERTY. MUDDY CREEK MINE.

Sample.—Subbituminous coal; Muddy Creek field, Wind River region; analysis No. 9132 (p. 306).

Mine.—Muddy Creek; in sec. 20, T. 6 N., R. 1 E., 14 miles southwest of Liberty, and about 35 miles northwest of Shoshone.

Coal bed.—The bed is Tertiary age, Fort Union formation. This bed is extremely variable in thickness. Dip, 28° E.

The bed was measured and sampled by E. G. Woodruff in June, 1909, as shown below:

Section of coal bed in Muddy Creek mine, 14 miles southwest of Liberty.

Laboratory No	9132	
Roof, sandstone.	*Ft.*	*in.*
Coal	0	8
Shale	0	4
Coal	0	4
Bone	0	8
Coal	3	6
Bone	0	4
Coal	6	4
Floor, bone.		
Thickness of bed	12	2

The lower 45 inches of the lower bench of coal was included in the sample, which was taken at the end of the slope, 75 feet from the mouth of the opening.

Notes.—The mine was idle at the time of sampling. The coal was dry and in a fairly good state of preservation.

For chemical analyses of this coal see part I of this bulletin, p. 306.

RIVERTON. SHIPTON MINE.

Sample.—Subbituminous coal; Alkali Butte field, Wind River region; analysis No. 9772 (p. 306).

Mine.—Shipton; in sec. 5, T. 2 S., R. 6 E., about 15 miles southeast of Riverton.

Coal bed.—This mine was being opened on one of the several beds in the Mesaverde formation; Cretaceous age. The bed at the end of the entry dips 12° N.

The bed was measured and sampled by Dean E. Winchester in August, 1909, as shown on the following page.

Section of coal bed in Shipton mine, 15 miles southeast of Riverton.

Laboratory No.	9772	
	Ft.	*in.*
Shale with some coal [a]	1	4
Coal	0	8
Bone [a]	0	8
Coal	4	10
Floor, shale.		
Thickness of bed	7	6
Thickness of coal sampled	5	6

[a] Not included in sample.

The sample was taken 45 feet from opening.

Note.—This mine was just being opened at the time of examination, and the sample showed some trace of surface weatherng.

For chemical analyses of this coal see part I of this bulletin, p. 306.

RIVERTON. KINNEAR MINE.

Sample.—Subbituminous coal; Pilot Butte field, Wind River region; analysis No. 9133 (p. 306).

Mine.—Kinnear; in sec. 13, T. 3 N., R. 1 W., about 30 miles northwest of Riverton.

Coal bed.—Kinnear. Cretaceous age; Mesaverde formation. Roof, shale; floor, shale. The bed dips 19° E.

The bed was measured and sampled, the sample including 2 feet 9 inches of coal. The sample was taken in the side entry where the coal was bright on June 26, 1909, by E. G. Woodruff.

Notes.—This mine consisted of a slope 300 feet long, from which one side entry 40 feet long had been turned near the bottom. The mine was worked periodically to supply local trade.

For chemical analyses of this coal see part I of this bulletin, p. 306.

RONGIS. SPEYER PROSPECT.

Sample.—Subbituminous coal; Great Divide Basin field; analysis No. 5816 (p. 306).

Location.—Speyer prospect; in the SW. ¼ SE. ¼ sec. 6, T. 27 N., R. 89 W., Fremont County, 18 miles southeast of Rongis. No railroad connection.

Coal bed.—No name. Cretaceous age; "Laramie" formation. Dip, 22°; roof, shale; floor, sandstone.

The bed was measured and sampled in 1907 by E. E. Smith, the sample including 6 feet of lower part of 16-foot bed of coal.

Notes.—Blocks of coal taken from a mine of this field in 1905, and kept in a shed with open windows until October, 1907, were large and firm, but the surface of the coal had lost its luster and was in places slightly checked. The specific gravity of the coal was considerably less than that of fresh coal from the same mine.

For chemical analyses of this coal see part I of this bulletin, p. 306; also U. S. Geol. Survey Bull. 341, p. 237.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 232.

JOHNSON COUNTY.

BARBER. SURFACE PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 6444 (p. 306).

Location.—Surface prospect; in sec. 29, T. 53 N., R. 77 W., about 8 miles south of the Chicago, Burlington & Quincy Railroad at Arvada, and 15 miles north of Barber.

Coal bed.—Lower Ulm or Healy coal at the base of the Ulm group of the Fort Union formation; Tertiary age.

The bed was measured and sampled by R. W. Stone and C. T. Lupton in August, 1908, as shown below:

Section of coal bed, 15 miles north of Barber.

Laboratory No.	6444	
	Ft.	*in.*
Coal [a]	2	6
Clay [a]	2	0
Coal	11	0
Clay [a]	1	0
Coal [a]	1	6
Thickness of bed	18	0
Thickness of coal sampled	11	0

[a] Not included in sample.

The sample was taken from a natural exposure which must necessarily have been more or less weathered. All checked coal was removed in order to get as fresh material as possible.

For chemical analyses of this coal see part I of this bulletin, p. 306.

BUFFALO. MITCHELL MINE.

Sample.—Subbituminous coal; Powder River field; analyses Nos. 6469, 6470 (p. 306).

Mine.—Mitchell; in the NE. ¼ sec. 26, T. 51 N., R. 82 W., 1 mile northeast of Buffalo.

Coal bed.—The bed is Cretaceous age; Piney formation. The roof is shale. Cover is about 110 feet thick, and consists in a great part of coal and shale beds.

The bed was measured and sampled in 1908 by H. S. Gale, as shown below:

Section of coal bed in Mitchell mine, 1 mile northeast of Buffalo.

	Ft.	*in.*
Coal [a]	1	8½
Shale	0	½
Coal [a]	2	8
Shale	0	4
Bone	2	11
Coal	1	7
Shale	0	6
Bone	1	10
Coal [b]	3	3
Shale	0	1
Coal [b]	0	11
Shale	0	2
Coal	0	2
Shale	0	½
Coal [b]	0	7
Shale	0	2
Coal [b]	1	8
Thickness of bed	18	7½

[a] Included in sample 6469.

[b] Included in sample 6470.

The mine had been opened the year before the time of taking sample 6470, but coal had been mined at this particular place (20 feet north of slope) only a few days before the samples were taken. The face of the coal showed no sign of weathering and no moisture was seen at this place. It is believed that the coal was practically unweathered.

Sample 6469 was taken from the wall of the slope near its foot. The coal had been exposed to the air for some months, but as there was considerable moisture present the face of the bed was as firm as when freshly mined. About 3 inches of the face was removed before the sample was cut.

Notes.—The coal of the Powder River field is dark brown or black, in contrast to the more woody brown of lignite. The coal is more brittle than lignite. Its calorific value averages about 10,000 British thermal units. A coal clean at one point may be continuous with and merge into a bony coal or carbonaceous shale which is worthless. In certain places along the outcrop is observed a thin parting of shale, which thickens in passing along the strike, separating the coal bed into benches in such a manner as to render worthless a bed that in other localities is valuable. In 1908 the field was distant from lines of transportation and therefore there was little demand for its coal. A few mines supplied fuel for local consumption.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 381, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 141.

BUFFALO. MUNKRE MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 6410 (p. 307).

Mine.—Munkre; in the SW. ¼ sec. 36, T. 51 N., R. 82 W., 1 mile east of Buffalo.

Coal bed.—The bed is Cretaceous age; Piney formation. The bed is 18 feet 5 inches thick, but only the 6-foot bench was worked at time of sampling. This bench carries a thin bone parting in some parts of the mine. There is about 85 feet of cover, consisting of shale and coal beds with a little alluvium at the surface.

The bed was measured and sampled in 1908 by C. H. Wegemann, as shown below:

Section of coal bed in Munkre mine, 1 mile east of Buffalo.

Laboratory No.	6410	
	Ft.	*in.*
Coal [a]	5	0
Shale [a]	0	7
Coal [a]	0	6
Shale [a]	0	4
Coal	6	0
Bone [a]	1	0
Coal [a]	5	0
Thickness of bed	18	5
Thickness of coal sampled	6	0

[a] Not included in sample.

Notes.—This was an old mine, but the sample was obtained from a face of coal which had been worked recently about 200 feet from the foot of the slope. No moisture was to be seen and it is believed that the coal was practically unweathered. The output of the mine during the winter was about 27 tons a day.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 381, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 141.

HAMILTON. PROSPECT.

Sample.—Bituminous coal; Powder River field; analyses Nos. 6434, 6435 (p. 307).

Location.—Surface prospect; in the SE ¼ sec. 3, T. 52 N., R. 82 W., 4 miles southwest of Hamilton and about 12 miles north of Buffalo.

Coal bed.—Healy. Cretaceous age; Piney formation. The bed is about 10 feet 10 inches thick, and was sampled by H. S. Gale in 1908. Coal is under 8 feet of cover.

Sections of coal bed in surface prospect, 4 miles southwest of Hamilton.

Laboratory No	6434		6435	
	Ft.	*in.*	*Ft.*	*in.*
Coal	[a] 2	0	[a] 2	0
Shale	[a] 0	4	[a] 0	4
Coal	2	6½	[a] 2	6½
Shale	[a] 0	1	[a] 0	1
Coal	[a] 0	7	[a] 0	7
Shale	[a] 0	1	[a] 0	1
Coal	[a] 1	7	1	7
Shale	[a] 0	½	[a] 0	½
Coal	[a] 0	4	[a] 0	4
Shale	[a] 0	½	[a] 0	½
Coal	[a] 0	11	0	11
Shale	[a] 0	3	[a] 0	3
Coal	[a] 1	0	1	0
Shale	[a] 0	1	[a] 0	1
Coal	[a] 1	0	[a] 1	0
Thickness of bed	10	10½	10	10½
Thickness of coal sampled	2	6½	3	6

[a] Not included in sample.

Sample 6435 was taken from lower part of bed, and sample 6434 from the upper part. Coal from this place had been mined on day before samples were taken, but the face of the coal had already begun to check. About 3 inches of surface was removed before samples were taken.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 381, p. 150.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 141.

NATRONA COUNTY.

CASPER. PROSPECT.

Sample.—Subbituminous coal; Glenrock field; analyses No. 5319 (p. 307).

Location.—Prospect; 8 miles southeast of Casper, in sec. 20, T. 33 N., R. 78 W.

Coal bed.—The coal bed is found in the lowest part of the sandstone of Montana formation; Cretaceous age. The thickness varies from 1 foot to 4 feet, but the bed is persistent. The roof is of shale 2 feet thick, overlain with sandstone. The floor is of clay, locally of sandstone.

The bed was measured and sampled by E. W. Shaw on July 8, 1907. The coal where sampled was 3 feet thick. The coal sampled was weathered.

Notes.—The coal was mined in several small banks. No coal was shipped from this bed.

The coal is black, but when it is exposed to the weather it cracks and the surface becomes slightly brown.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 162.

CASPER. PROSPECT.

Sample.—Subbituminous coal; Glenrock field; analysis No. 5323 (p. 307).

Location.—Prospect; 3 miles southwest of Big Muddy, and 13 miles east of Casper, in sec. 4, T. 33 N., R. 77 W.

Coal bed.—The coal bed is of Montana formation somewhat above the middle; Cretaceous age. The thickness varies from 6 inches to 3 feet. The dip is 2° to 5° NE. The roof and floor are of heavy, bedded, white sandstone. Thickness of the bed 22 inches.

The bed was measured and sampled by E. W. Shaw on September 1, 1907. The sample included 1 foot 10 inches of clear coal, weathered.

Note.—This coal is probably of somewhat better quality than the Fort Union coals. For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 162.

EFELL. EFELL MINE.

Sample.—Subbituminous coal; Powder River field, Wind River region; analysis No. 9149 (p. 307).

Mine.—Efell; Efell district; in sec. 8, T. 33 N., R. 83 W., 3 miles northwest of Efell.

Coal bed.—One of the several beds in the Mesaverde formation; Cretaceous age. Dip 62° SE.

The bed was measured and sampled by Dean E. Winchester in September, 1909, as shown below:

Section of coal bed in Efell mine at Efell.

Laboratory No	9149	
Roof, bone.	*Ft.*	*in.*
Coal	3	4
Sandstone [a]	1	1
Coal	1	2
Floor, bone.		
Thickness of bed	5	7
Thickness of coal sampled	4	6

[a] Not included in sample.

Notes.—The mine consisted of a single entry or tunnel driven 200 feet along the strike of the bed. The mine was worked during the winter to supply the demands of a few nearby ranchers.

For chemical analyses of this coal see part I of this bulletin, p. 307.

OIL CITY. LOCAL MINE.

Sample.—Subbituminous coal; Powder River field, Wind River region; analysis No. 9145 (p. 307).

Mine.—Small local mine; in sec. 27, T. 34 N., R. 86 W., about 2½ miles northwest of Oil City.

Coal bed.—The bed is Cretaceous age; Mesaverde formation. The bed dips 18° NE., and the prospect is driven along the strike of the bed.

The bed was measured and sampled by E. G. Woodruff in 1909, as shown below:

Section of coal bed in local mine, 2½ miles northwest of Oil City.

Laboratory No	9145	
Roof, shale.	*Ft.*	*in.*
Coal [a]	3	4
Shale [a]	4	2
Coal	5	3
Shale [a]	0	2
Coal	1	11
Thickness of bed	14	10
Thickness of coal sampled	7	2

[a] Not included in sample.

The sample was taken at the end of the main entry, 90 feet from the opening.

Notes.—No work was being done at the time the mine was visited, although it was worked periodically to supply local trade. The coal included in the sample was in a good state of preservation.

For chemical analyses of this coal see part I of this bulletin, p. 307.

POWDER RIVER. LOCAL MINE.

Sample.—Subbituminous coal; Powder River field, Wind River region; analysis No. 9183 (p. 307).

Mine.—Small mine (not worked); 2½ miles southwest of Powder River, in sec. 14, T. 35 N., R. 85 W.

The bed was measured and sampled by D. E. Winchester in October, 1909, as shown below:

Laboratory No.	9183	
Roof, sandstone.	*Ft.*	*in.*
Bone[a]	0	3
Coal	4	1
Sandstone[a]	0	1
Coal	0	4
Floor, shale.		
Thickness of bed	4	9
Thickness of coal sampled	4	5

[a] Not included in sample.

The sample was measured at the end of the main entry, 350 feet from the mouth of the mine.

The coal included in the sample was in a fairly good state of preservation.

For chemical analyses of this coal see part I of this bulletin, p. 307.

PARK COUNTY.

Certain towns and mines now included in Park County are in this report listed under Bighorn County.

SHERIDAN COUNTY.

ARVADA. ARVADA MINE.

Sample.—Subbituminous coal; Powder River field; analyses Nos. 6459, 6461 (p. 307).

Mine.—Arvada; on the bank of Powder River, in the NE. ¼ NW. ¼ sec. 21, T. 54 N., R. 77 W., ½ mile south of the Chicago, Burlington & Quincy Railroad at Arvada.

Coal bed.—Arvada, in the lower portion of the Intermediate group of the Fort Union formation; Tertiary age. This coal bed has roof and floor of clay. The coal is 10 feet 8 inches thick with thin streaks of charcoal. The upper half of the bed is thinly bedded, and the lower half is massive.

The bed was measured and sampled by R. W. Stone and C. T. Lupton in July, 1908. Sample 6459 represented 10 feet 8 inches of weathered coal, or the entire bed. Sample 6461 represented the lower half of the bed and consisted of solid block coal, weathered. The samples were taken about 100 feet from the entry, and as no mining had been done for several months represented somewhat weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 307.

CARNEYVILLE. CARNEY MINE.

Sample.—Subbituminous coal; Powder River field; analyses Nos. 5387, 5388 (p. 307).

Mine.—Carney; 1 mile east of Carneyville, in sec. 16, T. 57 N., R. 84 W., Sheridan County.

Coal bed.—Carney. Tertiary age; Fort Union formation. The bed is about 15 feet thick with a shale roof and carbonaceous shale floor.

The bed was measured and sampled at two points in 1907. Sample 5387 represented 4 feet 6 inches of coal in the upper bench. Sample 5388 represented 10 feet 9 inches of coal in the lower bench. There is a shale parting, 2 to 4 inches thick, between the benches.

Note.—The coal is distinctly black and has a shiny luster when fresh.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

CARNEYVILLE. EVANS MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5377 (p. 307).

Mine.—Evans; on Tongue River, in the S. ½ sec. 2, T. 57 N., R. 84 W., 3½ miles northeast of Carneyville.

Coal bed.—Evans. Tertiary age; Fort Union formation. The bed is about 17 feet thick, with a light-blue shale roof 16 feet thick.

The bed was measured and sampled by J. A. Taff in 1907, as shown below:

Section of coal bed in Evans mine, 3½ miles northeast of Carneyville.

Laboratory No	5377	
Roof, light-blue shale.	*Ft.*	*in.*
Coal and shale, alternate layers [a]	2	10
Coal	5	2
Bony shale, thin parting	..	..
Coal to level of river	9	2
Base of coal bed concealed.		
Thickness of bed	17	2
Thickness of coal sampled	14	4

[a] Not included in sample.

The sample was taken 60 feet in the mine, and included 7 feet of coal from the middle part of the bed.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Survey Bull. 341, p. 126.

CARNEYVILLE. EVANS MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5382 (p. 307).

Mine.—Evans. On Badger Creek in the NE. ¼ sec. 29, T. 58 N., R. 82 W., 13 miles northeast of Carneyville and 3 miles southeast of Decker.

Coal bed.—No name. Tertiary age; Fort Union formation.

The bed was measured and sampled in 1907 by Joseph A. Taff. The sample was taken in mine, 30 feet from entrance, and represented 6 feet of clear coal in the middle of the 9-foot bed. The sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 142.

CARROLL. BETHEUREM PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5748 (p. 307).

Location.—Betheurem prospect; in sec. 14, T. 54 N., R. 83 W., 1¼ miles north of Carroll.

Coal bed.—Lower Ulm. Tertiary age; Fort Union formation. The bed is about 6 feet 2 inches thick, overlain with shale.

The bed was measured and sampled by J. A. Taff in October, 1907, as shown below:

Section of coal bed in Betheurem prospect, 1¼ miles north of Carroll.

Laboratory No	5748	
Roof, shale.	*Ft.*	*in.*
Coal, bony	2	4
Shale, carbonaceous [a]	0	6
Coal	1	0
Shale, blue [a]	0	4
Coal, bony	2	0
Thickness of bed	6	2
Thickness of coal sampled	5	4

[a] Not included in sample.

The sample was taken about 75 feet in.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

Dietz. Dietz No. 1 Mine.

Sample.—Subbituminous coal; Powder River field; analysis No. 5381, (p. 307).

Mine.—Dietz No. 1; at Dietz, in sec. 34, T. 57 N., R. 84 W.

Coal bed.—Dietz No. 1. Tertiary age; Fort Union formation. The bed is about 12 feet 1 inch thick. Roof and floor, shale.

The bed was measured and sampled by J. A. Taff in August, 1907, as shown below:

Section of coal bed in Dietz No. 1 mine at Dietz.

Laboratory No	5381	
Roof, gray shale.	*Ft.*	*in.*
Coal [a]	2	0
Shale, gray [a]	1	6
Coal	7	10
Shale [a]	0	1
Coal	0	9
Floor, shale.		
Thickness of bed	12	2
Thickness of coal sampled	8	7

[a] Not included in sample.

Sample 5381 was taken 2,800 feet from the mine entrance.

For chemical analyses of this coal see part I of this bulletin, p. 307; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

Dietz. Dietz No. 4 Mine.

Sample.—Subbituminous coal; Powder River field; analysis No. 5378 (p. 308).

Mine.—Dietz No. 4; at Dietz, in sec. 34, T. 57 N., R. 84 W., Sheridan County, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Dietz No. 2. Tertiary age; Fort Union formation; 8 feet 6 inches of clear coal.

The bed was measured and sampled in 1907 by Joseph A. Taff. The sample was taken in mine, 600 feet from entrance.

Note.—If protected from the weather, the coal will not slack for an indefinite time.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 140.

Dietz. Dietz No. 3 Mine.

Sample.—Subbituminous coal; Powder River field; analysis No. 5379 (p. 308).

Mine.—Dietz No. 3; ¾ mile south of Dietz, in sec. 3, T. 56 N., R. 84 W., Sheridan County, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Dietz No. 2. Tertiary age; Fort Union formation.

The bed was measured and sampled in 1907 by Joseph A. Taff. The measurement showed 5½ feet of coal separated by a shale parting from 3 feet of coal below. The sample was taken in mine, 400 feet from entrance.

Note.—If protected from the weather, the coal will not slack for an indefinite time.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 140.

DIETZ. DIETZ NO. 2 MINE.

Sample.—Subbituminous coal; Powder River field; analyses Nos. 5385, 7591 (p. 308).

Mine.—Dietz No. 2; 1 mile east of Dietz, in sec. 35, T. 57 N., R. 84 W., Sheridan County, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Dietz No. 2. Tertiary age; Fort Union formation. Thickness, 8 feet 6 inches of clear coal.

The bed was measured and sampled in August, 1907, by Joseph A. Taff. The sample (No. 5385) included an 8½-foot cut, and was taken 2,000 feet from mouth of mine.

The bed was also measured and sampled by K. M. Way in 1909. The sample (No. 7591) included 5 feet 11½ inches of coal, and was taken from face of south entry 1, off new east entry.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 140.

DIETZ. DIETZ NO 5 MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5384 (p. 308).

Mine.—Dietz No. 5; 1¼ miles north of Dietz, in sec. 27, T. 57 N., R. 84 W., Sheridan County, on Chicago, Burlington & Quincy Railroad.

Coal bed.—Dietz No. 2. Tertiary age; Fort Union formation. The bed was measured and sampled in August, 1907, by Joseph A. Taff. The sample included an 8½ foot cut of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p.135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 141.

DIETZ. PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5383 (p. 308).

Location.—Prospect; on Goose Creek in the NE. ¼ sec. 22, T. 57. N., R. 84 W., 2 miles north of Dietz.

Coal bed.—Dietz No. 3. Tertiary age; Fort Union formation.

The bed was measured and sampled in 1907 by Joseph A. Taff. The sample included a 6-foot cut of coal from the bed which was reported to be about 14 feet thick. The sample was taken in prospect, 80 feet from mouth. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 140.

DIETZ. ROLAND MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5380 (p. 308).

Mine.—Roland; in sec. 25, T. 57 N., R. 84 W., 2 miles northeast of Dietz.

Coal bed.—Roland. Tertiary age; Fort Union formation.

The bed was measured and sampled in 1907 by Joseph A. Taff. The sample was taken from a 7½-foot cut of coal, under which was 5 feet 6 inches of coal. The sample was taken in prospect, 60 feet from entrance. The coal was probably weathered.

Note.—If protected from the weather, the coal will adhere together for an indefinite time.

For chemical analyses of this coal see part I of this bulletin, p. 308; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 142.

KENDRICK. SWEAT'S MINE.

Sample.—Subbituminous coal; Powder River field; analyses Nos. 7374, 6798 (p. 308).

Mine.—Sweat's; a drift mine in sec. 13, T. 55 N., R. 78 W., 1½ miles north of the Chicago, Burlington & Quincy Railroad at Kendrick.

Coal bed.—Arvada. Tertiary age; Intermediate group of the Fort Union formation.

The bed was measured and sampled at two points.

Sample 7374 was taken by J. N. Sweat, under the direction of R. W. Stone, and represented 9 feet of absolutely fresh coal from the face of a drift 100 feet long.

Sample 6798 was taken from the face of a drift about 40 feet long, and represented the entire thickness of the bed, which is 9 feet of clean solid subbituminous coal. The sample was taken by R. W. Stone and C. T. Lupton in November, 1908. This coal should have been fresh, for the face had been mined the previous day and there were no indications of surface weathering.

For chemical analyses of this coal see part I of this bulletin, p. 308.

KENDRICK. SURFACE OUTCROP.

Sample.—Subbituminous coal; Powder River field; analysis No. 6460 (p. 308).

Location.—Outcrop; on bank of Clear Creek near Culture ranch, in the NW. ¼ NW. ¼ sec. 12, T. 55 N., R. 78 W., 3 miles north of the Chicago, Burlington & Quincy Railroad at Kendrick.

Coal bed.—Smith. Fort Union formation; Tertiary age. The bed has a sandstone roof and floor, and a thickness of 10 feet of clean coal.

The bed was measured and sampled by R. W. Stone in July, 1908. The sample was taken from a 10-foot cut of clean coal. It was taken at a clean washed outcrop in the bank of the creek, and although exposed constantly to the air, represented fairly fresh coal.

For chemical analyses of this coal see part I of this bulletin, p. 308.

KENDRICK. WYOMING SMOKELESS MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5922, (p. 309).

Mine.—Wyoming Smokeless; a shaft mine, in the NE. ¼ SE. ¼ sec. 24, T. 55 N., R. 78 W., at Kendrick.

Coal bed.—Kendrick. Tertiary age; Fort Union formation.

The bed was measured and sampled on January 23, 1908, the sample representing the entire bed of 12 feet of clear coal. The sample was taken at bottom of shaft 150 feet deep.

For chemical analyses see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

MONARCH. MONARCH MINE.

Sample.—Subbituminous coal; Powder River field; (Wyoming No. 1) analyses Nos. 1368, 1369, 5386, 5395, (p. 309).

Mine.—Monarch; in sec. 19, T. 57 N., R. 84 W., at Monarch, 9 miles northwest of Sheridan, on the Burlington & Missouri River Railroad.

Coal bed.—Monarch. Tertiary age; Fort Union formation, about 500 feet above the bottom of it. It is thought to be the fourth in a series of 25 beds. At Dietz, 4 miles southeast of Monarch, beds Nos. 9 and 10 are mined. The twenty-fifth bed outcrops at Gillette. The coal is free from partings, and is 28 to 32 feet thick. Usually the upper 6 feet of coal are interbedded with shale, leaving a workable thickness of from 22 to 26 feet.

The working faces about 1,600 feet from the shaft were measured and sampled by F. W. de Wolf, in 1904. Analyses appear under laboratory Nos. 1368 and 1369.

The bed was also measured and sampled at two points in 1907 by Joseph A. Taff. The samples (Nos. 5386 and 5395) were obtained 3,000 feet from mine entrance, where the bed is said to be 18 feet thick. Sample 5395 was taken near the outcrop and the coal may have been slightly weathered.

Notes.—The output in 1904 was about 1,000 tons daily, of which about one-third was used by locomotives, the remainder being equally divided between factories and household use. This coal is black and pitchy-looking.

For steaming tests of this coal see U. S. Geol. Survey Bull. 261, p. 83; Prof. Paper 48, p. 929; for briquetting tests, see U. S. Geol. Survey Bull. 261, p. 165. Prof. Paper 48, p. 1451.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Prof. Paper 48, pp. 138, 262; Bull 261, p. 59; Bull. 341, p. 138.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 138.

MONARCH. KENNEDY PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5393 (p. 309).

Mine.—Kennedy prospect, in sec. 24, T. 57 N., R. 85 W., 1 mile northwest of Monarch.

Coal bed.—Monarch. Tertiary age; Fort Union formation. The entire bed is reported to be 34 feet thick.

The bed was measured and sampled in 1907 by Joseph A. Taff. The sample represented 6 feet of coal, and was obtained from the lower part of the bed 100 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 138.

MONARCH. MASTERS MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5389 (p. 309).

Mine.—Masters; 1½ miles west of Monarch, in sec. 14, T. 57 N., R. 85 W.

Coal bed.—Upper Masters. Tertiary age; Fort Union formation. The bed is about 6 feet thick.

The bed was measured and sampled by J. A. Taff in August, 1907, as shown below:

Section of coal bed in the Masters mine, 1½ miles west of Monarch.

Laboratory No.	5389	
Roof, soft, drab shale.	*Ft.*	*in.*
Coal	4	10
Shale[a]	0	3
Coal[a]	0	11
Thickness of bed	6	0
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken 300 feet from the mine entrance.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

MONARCH. KOOI MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5391 (p. 309).

Mine.—Kooi; in sec. 23, T. 57 N., R. 85 W., 2 miles northwest of Monarch, Sheridan County, on the Chicago, Burlington & Quincy Railroad.

Coal bed.—Monarch. Tertiary age; Fort Union formation.

The bed was measured and sampled in August, 1907 by Joseph A. Taff. The coal was reported to be 15 feet thick, the lower part, 7 feet 4 inches, being mined. The sample was obtained from this part, 150 feet from the entrance of the mine.

Notes.—If protected from the weather this coal will not slack for an indefinite time and for this reason it is preferably shipped in box cars. Its efficiency as a fuel is greater than that of the lignites.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 126.

MONARCH. CONABLE PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5394 (p. 309).

Location.—Conable prospect; in sec. 12, T. 57 N., R. 85 W., near Monarch.

Coal bed.—Carney. Tertiary age; Fort Union formation.

The bed was measured and sampled in August, 1907, by Joseph A. Taff.

Section of coal bed in Conable prospect near Monarch.

Laboratory No	5394	
	Ft.	*in.*
Coal [a]	5	0
Shale [a]	1	0
Coal	8	0
Thickness of bed	14	0
Thickness of coal sampled	8	0

[a] Not included in sample.

The sample was taken in mine, 150 feet from entrance, and was probably weathered.

Notes.—If protected from the weather the coal will not slack. Its efficiency as a fuel is greater than that of the lignites.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

SHERIDAN. SMITH MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5545 (p. 309).

Mine.—Smith; in the NW. ¼ NE. ¼ sec. 10, T. 56 N., R. 84 W., 3 miles north of Sheridan.

Coal bed.—Smith. Tertiary age; Fort Union formation.

The bed was measured and sampled in October, 1907, by Joseph A. Taff, as shown below:

Section of coal bed in Smith mine, near Sheridan.

Laboratory No	5545	
Roof, shale.	*Ft.*	*in.*
Coal, bony [a]	0	6
Coal	4	11
Floor, shale.		
Thickness of bed	5	5
Thickness of coal sampled	4	11

[a] Not included in sample.

The sample was taken in mine 200 feet from entrance.

Notes.—In 1907 coal was hauled from this mine in wagon to Sheridan, for domestic use. If protected from the weather this coal will not slack for an indefinite time. Its efficiency as a fuel is greater than that of the lignites.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 141.

SHERIDAN. MARTIN PROSPECT.

Sample.—Subbituminous coal; Powder River field; analysis No. 5546 (p. 309).

Location.—Martin prospect; in the SW. ¼ NW. ¼ sec. 7, T. 55 N., R. 83 W., 3½ miles southeast of Sheridan.

Coal bed.—No name. Tertiary age; Fort Union formation. The bed was measured and sampled by Joseph A. Taff in October, 1907.

Section of coal bed in Martin prospect, near Sheridan.

Laboratory No	5546	
Roof, shale.	*Ft.*	*in.*
Coal, bony [a]	3	6
Shale [a]	2	0
Coal, bony	4	10
Thickness of bed	10	4
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken 100 feet from the prospect entrance. It was probably weathered.

Notes.—If protected from the weather the coal will adhere together for an indefinite time. Its efficiency as a fuel is greater than that of the lignites.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 144.

SHERIDAN. BLACK DIAMOND MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5392 (p. 309).

Mine.—Black Diamond; in sec. 3, T. 55 N., R. 85 W., Sheridan County, north side of Big Goose Creek, 6 miles southwest of Sheridan.

Coal bed.—Monarch (?). Tertiary age, Fort Union formation.

The bed was measured and sampled by Joseph A. Taff in August, 1907, as follows:

Section of coal bed in Black Diamond mine, 6 miles from Sheridan.

Laboratory No	5392	
	Ft.	*in.*
Coal	12	0
Coal and shale [a]	3	6
Thickness of bed	15	6
Thickness of coal sampled	12	0

[a] Not included in sample.

The sample was taken in main entry, 325 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 139.

SHERIDAN. NELSON MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5390 (p. 309).

Mine.—Nelson; in the SE. ¼ sec. 14, T. 55 N., R. 85 W., on Beaver Creek, 6½ miles southwest of Sheridan. No railroad connection.

Coal bed.—Monarch (?). Tertiary age; Fort Union formation. The bed was measured and sampled in August, 1907, by Joseph A. Taff, as shown on the following page:

Section of coal bed in Nelson mine, 6 miles from Sheridan.

Laboratory No	5390
	Ft. in.
Coal [a]	6 6
Shale [a]	1 0
Coal	12 0
Thickness of bed	19 6
Thickness of coal sampled	12 0

[a] Not included in sample.

The sample was taken in main entry, 650 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 139.

SHERIDAN. MOORE MINE.

Sample.—Subbituminous coal; Powder River field; analysis No. 5747 (p. 309).

Mine.—Moore (local); in south ½ of sec. 11, T. 55 N., R. 85 W., 8 miles southwest of Sheridan. No railroad connection.

Coal bed.—Monarch (?). Tertiary age; Fort Union formation.

The coal was measured and sampled by Joseph A. Taff in October, 1907, as described below:

Section of coal bed in Moore mine, 8 miles southwest of Sheridan.

Laboratory No	5747
	Ft. in.
Coal [a]	2 0
Coal	9 0
Thickness of bed	11 0
Thickness of coal sampled	9 0

[a] Not included in sample.

The sample was taken 150 feet from entrance of mine.

For chemical analyses of this coal see part I of this bulletin, p. 309; also U. S. Geol. Survey Bull. 341, p. 135.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 139.

SWEETWATER COUNTY.

ALKALI BUTTE. SIGNOR MINE.

Sample.—Subbituminous coal; Alkali Butte field; Wind River region; analysis No. 6710 (p. 310).

Mine.—Signor; in sec. 25, T. 34 N., R. 95 W., south of Alkali Butte.

The bed was measured and sampled in 1908 by E. G. Woodruff as described below:

Section of coal bed in Signor mine, south of Alkali Butte.

Laboratory No	6710
Roof, sandy shale.	*Ft. in.*
Bone [a]	0 3
Shale [a]	0 6
Bone [a]	0 4
Coal	4 2
Thickness of bed	5 3
Thickness of coal sampled	4 2

[a] Not included in sample.

The sample was taken in first south entry, about 100 feet from opening.

Notes.—The mine was worked periodically on a small scale. The coal was in a fairly good state of preservation.

For chemical analyses of this coal see part I of this bulletin, p. 310.

Black Buttes. Black Buttes Mine.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 5952 (p. 310).

Mine.—Black Buttes (abandoned); in sec. 16, T. 18 N., R. 100 W., at Black Buttes.

Coal bed.—The bed is Cretaceous age, "Laramie" formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 5 feet 6 inches of clear coal, and was taken 250 feet from entrance of mine.

Notes.—The coal is jet black, has a bright or even glassy luster. The coal is dense in texture and somewhat brittle. The streak ranges in color from brownish-black to black. The coal on exposure to air remains firm and compact and stands shipment without breaking down.

For chemical analyses of this coal see part I of this bulletin, p. 310; also U. S. Geol. Survey Bull. 341, p. 272.

Black Buttes. Rock Springs-Gibraltar Mine.

Sample.—Subbituminous coal; Rock Springs field; analysis Nos. 5808, 5811, 7170, 7093, 7096, 7097, 7103 (p. 310).

Mine.—Rock Springs-Gibraltar; in sec. 20, T. 18 N., R. 100 W., 1 mile south of Black Buttes, on the Union Pacific Railway.

Coal bed.—Not named. Cretaceous age, Laramie formation.

The bed was measured and sampled in 1907 at seven places by V. H. Barnett, as described below:

Sections of coal beds in Rock Springs-Gibraltar mine.

Laboratory No	5808		5811	
	Ft.	*in.*	*Ft.*	*in.*
Coal, upper bed	6	6	..	..
Interval, 78 feet.				
Coal, lower bed	..	..	4	6
Thickness of bed and coal sampled	6	6	4	6

Sample 5808 was taken 150 feet from entrance of mine.

Sample 5811 was taken 140 feet from entrance of mine.

Samples 7170, 7093, 7096, 7097, and 7103 represented 6½ feet of coal, and were taken to show effect of weathering.

Sample 7170 was taken in mine, 100 feet from entrance.

Sample 7103 was taken in mine, 50 feet from entrance; coal weathered.

Sample 7097 was taken in mine, 150 feet from entrance.

Sample 7096 was taken in mine, 225 feet from entrance.

Sample 7093 was taken in the NE. ¼ NE. ¼ sec. 20, T. 18 N., R. 100 W.; 70½-inch cut; taken in mine, 355 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 310; also U. S. Geol. Survey Bull. 341, p. 272, and Bull. 381, p. 244.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 293.

Black Buttes. Rock Springs-Sioux City Mine.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 5930 (p. 310).

Mine.—Rock Springs-Sioux City; in the NE. ¼ NE. ¼ sec. 28, T. 19 N., R. 100 W., 3 miles north of Black Buttes.

Coal bed.—Not named. Tertiary age, Wasatch formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The bed is 21 feet thick, of which 8 feet of clear coal was sampled.

For chemical analyses of this coal see part I of this bulletin, p. 310; also U. S. Geol. Survey Bull. 341, p. 272.

For geologic relations see U. S. Geol. Survey Bull. 341, pp. 261, 276.

BLACK BUTTES. PROSPECT PIT.

Sample.—Subbituminous coal; Rock Springs field; analyses Nos. 5810, 5951 (p. 310).

Mine.—Prospect pit; in sec. 31, T. 19 N., R. 100 W., 3 miles northwest of Black Buttes. No railroad connection.

Coal bed.—The bed is Cretaceous age, "Laramie" formation.

The bed was measured and sampled at two places in 1907 by A. R. Shultz and V. H. Barnett.

Sample 5810 represented 5½ feet of clear coal. It was taken in prospect, 175 feet from entrance.

Sample 5951 represented 6¼ feet of coal. It was taken in prospect, 90 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 310; also U. S. Geol. Survey Bull. 341, p. 272.

CRESTON. LATHAM PROSPECT.

Sample.—Subbituminous coal; Great Divide Basin field; analysis No. 5949 (p. 311).

Mine.—Latham prospect; a prospect in the SE. ¼ SE. ¼ sec. 14, T. 20 N., R. 93 W., 4 miles west of Creston.

Coal bed.—The coal bed is Tertiary age, Wasatch formation.

The bed was measured and sampled in 1907 by E. E. Smith, as described below:

Section of coal bed in Latham prospect, 4 miles west of Creston.

Laboratory No	5949	
	Ft.	*in.*
Coal	1	0
Parting [a]	0	1
Coal	5	0
Parting [a]	0	½
Coal	0	8
Thickness of bed	6	9½
Thickness of coal sampled	6	8

[a] Excluded from sample.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 341, p. 238.

CRESTON. CHEROKEE ABANDONED PROSPECT.

Sample.—Subbituminous coal; Great Divide Basin field; analysis No. 5817 (p. 311).

Location.—Cherokee abandoned prospect; in the NW. ¼ SE. ¼ sec. 10, T. 20 N., R. 91 W., 7 miles east of Creston.

Coal bed.—The bed is of Cretaceous or Tertiary age, "Upper Laramie" formation.

The bed was measured and sampled in 1907 by E. E. Smith, as described below:

Section of coal bed in Cherokee abandoned prospect.

Laboratory No	5817	
	Ft.	*in.*
Coal	4	3
Bone [a]	0	3
Coal	1	5
Thickness of bed	5	11
Thickness of coal sampled	5	8

[a] Not included in sample.

The sample was taken 100 yards north of Cherokee siding.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 341, p. 238.

Gunn. Gunn-Quealy "A" and "B" Mines.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5805, 5806, 7089, 7090, 7091, 7092, 8534 (p. 311).

Mines.—Gunn-Quealy "A" and "B," at Gunn, in the NW. ¼ SE. ¼ sec. 8, T. 19 N., R. 104 W., on the Union Pacific Railway.

Coal bed.—Upper and Lower Vandyke. Cretaceous age, Mesaverde formation.

The Upper Van Dyke bed was measured and sampled at two points on November 1, 1907, by A. R. Schulz.

Sample 5805 was taken in main slope of the "A" mine, 200 feet from entrance, and represented a 4¾-foot cut.

Sample 5806 was taken 300 feet from entrance of the "B" mine in the main slope, from a 6-foot cut.

The beds were also measured and sampled at five points in 1908 to show effects of weathering.

Four samples, each representing a 70-inch cut, were taken from the Upper Vandyke bed in the "B" mine, as described below:

Sample 7991 was taken 800 feet in.

Sample 7090 was taken 10 feet from entrance. Coal very much weathered.

Sample 7089 was taken 80 feet from entrance; weathered.

Sample 7092 was taken in room 7, off second entry, 150 feet from entrance.

Sample 8534 was taken from the Lower Vandyke bed, in main entry, 1,100 feet from entrance, in 9½° slope.

The sample represented a 70-inch cut.

For chemical analyses of this coal see part I of this bulletin, pp. 311, 313; also U. S. Geol. Survey Bull. 381, p. 242.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 289.

Lost Soldier. Prospect.

Sample.—Subbituminous coal; Great Divide Basin field; analysis No. 5826 (p. 311).

Location.—Prospect; in the NE. ¼ NW. ¼ sec. 16, T. 26 N., R. 90 W., 1½ miles east of Lost Soldier tunnel. No railroad connection.

Coal bed.—The coal bed is Cretaceous age, "Laramie" formation.

The bed was measured and sampled in 1907 by E. E. Smith, as described below:

Section of coal bed in prospect near Lost Soldier.

Laboratory No	5826	
	Ft.	*in.*
Coal [a]	9	9
Coal	10	0
Thickness of bed	19	9
Thickness of coal sampled	10	0

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 341, p. 237.

Maxon. McCourt Mine.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6797 (p. 311).

Mine.—McCourt; 4 miles east of Maxon, in the NE. ¼ NE. ¼ sec. 25, T. 14 N., R. 104 W.

Coal bed.—Almond group. The coal is of Cretaceous age, upper part of Mesaverde formation. The bed is 6 feet 6 inches thick, with a sandy clay roof and shale floor.

The bed was measured and sampled by J. L. Rich on October 26, 1908. The sample represented 6½ feet of coal. It was taken 30 feet in the mine.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 381, p. 243.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 230.

MAXON. KOSKIE PROSPECT.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 6795 (p. 311).

Location.—Koskie prospect; on Canyon Creek, in sec. 7 or 8, T. 12 N., R. 101 W., 15 miles southeast of Maxon. No railroad connection.

Coal bed.—The bed is Tertiary age, Wasatch formation.

The bed was measured and sampled in 1908 by E. E. Smith, as described below:

Section of coal bed in Koskie prospect, 15 miles southeast of Maxon.

Laboratory No	6795	
Roof, shale.	*Ft.*	*in.*
Coal	2	0
Shale [a]	0	2
Coal	2	5
Shale [a]	0	2
Coal	2	4
Thickness of bed	7	1
Thickness of coal sampled	6	9

[a] Not included in sample.

The sample was taken 50 feet from the entrance to the prospect. The coal was somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 381, p. 245.

POINT OF ROCKS. POINT OF ROCKS MINE.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5351, 5352, 7087, 7088, 7094, 7095, 7102 (pp. 311, 312).

Mine.—Point of Rocks; in the SW. ¼ SW. ¼ sec. 26, T. 20 N., R. 101 W., at Point of Rocks, on the Union Pacific Railway.

Coal bed.—Upper, except sample 5352, which is Lower. Cretaceous age, Mesaverde formation.

Samples 5351 and 5352 were taken by John L. Rich on November 12, 1907.

Samples 7087, 7088, 7095, and 7102 were taken on November 12, 1908, by B. L. Johnson, who measured the following section:

Section of Upper coal bed at Point of Rocks mine.

	Ft.	*in.*
Coal	2	8
Bone	0	2
Coal	1	3½
Bone	0	½
Coal	3	½
Thickness of bed	7	1½

Sample 5351 was taken from new crosscut, 75 feet below surface and 225 feet from entrance and included a 6½-foot cut.

Sample 5352 was taken at end of old entry, 575 feet from entrance, and included a 5-foot 1-inch cut of clear coal.

The samples represented the entire bed except the bone partings.

Sample 7088 was taken 50 feet from entrance and represented a 6½-foot cut.

Sample 7095 was taken 150 feet from entrance and represented an 86-inch cut.

Sample 7087 was taken 300 feet from north of entrance, main heading.

Sample 7094 was taken 500 feet from entrance, main heading.

Sample 7102 was taken 1,000 feet from entrance, main heading, and represented a 61-inch cut.

For chemical analyses of this coal see part I of this bulletin, p. 311; also U. S. Geol. Survey Bull. 341, p. 272; Bull. 381, pp. 243, 246, 291.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 275; Bull. 341, p. 277.

ROCK SPRINGS. UNION PACIFIC NO. 1 MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5358 (p. 312).

Mine.—Union Pacific No. 1; at Rock Springs, Sweetwater County, in sec. 35, T. 19 N., R. 105 W., on the Union Pacific Railway.

Coal bed.—No. 1. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 17, 1909, by John L. Rich, as shown below:

Section of coal bed in Union Pacific No. 1 mine at Rock Springs.

Laboratory No	5358	
	Ft.	*in.*
Coal [a]	1	10
Bone [a]	0	9
Coal	6	11
Thickness of bed	9	6
Thickness of coal sampled	6	11

[a] Not included in sample.

The sample was taken in room 66.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 276.

ROCK SPRINGS. SWEETWATER NO. 2 MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5359 (p. 312).

Mine.—Sweetwater No. 2; 1± mile nearly east of Rock Springs, in sec. 26, T. 19 N., R. 105 W., on the Union Pacific Railway.

Coal bed.—No. 7. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 17, 1907, by A. R. Schultz. The sample included 5 feet 4 inches of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 276.

ROCK SPRINGS. UNION PACIFIC OLD NO. 5 MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5357 (p. 312.)

Mine.—Union Pacific Old No. 5; 1 mile east of Rock Springs, in sec. 26, T. 19 N., R. 105 W., on the Union Pacific Railway.

Coal bed.—No. 5. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 17, 1907, by A. R. Schultz. The sample included 3 feet 2 inches of clear coal. It was taken in the mine, 20 feet from the entrance.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 271.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 276.

Rock Springs. Union Pacific No. 3 Mine.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5363 (p. 312).

Mine.—Union Pacific No. 3; in sec. 25, T. 19 N., R. 105 W., 1½ miles northeast of Rock Springs.

Coal bed.—No. 7. The coal is of Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz; the sample was taken at point where the bed measured 29 inches (upper bench).

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 271.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 259.

Rock Springs. Union Pacific No. 8 Mine.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5361 (p. 312).

Mine.—Union Pacific No. 8. A shaft mine 1½ miles northeast of Rock Springs, in sec. 25, T. 19 N., R. 105 W., on the Union Pacific Railway.

Coal bed.—No. 7. Cretaceous age; Mesaverde formation.

Below the coal there is 6 feet or more of brown shale containing in places a little coal. Below this is a sandstone layer. The roof of the mine is a bluish to chocolate-colored shale locally carrying fossils. Where fossils are present the roof is not so good as elsewhere. In mining, a thin layer of coal is left to form the roof, as it is better than shale, which is liable to flake off.

The bed was measured and sampled on September 17, 1907, by John L. Rich, as shown below:

Section of coal bed in Union Pacific No. 8 mine, 1½ miles northeast of Rock Springs.

Laboratory No.	5361	
	Ft.	*in.*
Coal	2	1½
Shale [a]	0	½
Coal	5	5
Thickness of bed	7	7
Thickness of coal sampled	7	6½

[a] Excluded from sample.

The sample was taken in room 13, off the second entry.

Notes.—Entries are driven on each side of the slopes and rooms are turned off parallel to the slopes. The coal is very clean and needs no sorting after leaving the mine.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 265.

Rock Springs. Union Pacific No. 9 Mine.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5362 (p. 312).

Mine.—Union Pacific No. 9. A slope mine in sec. 25, T. 19 N., R. 105 W., 1½ miles north of Rock Springs, on the Union Pacific Railway. The main entry is 12,700 feet long, and the coal is brought to it through three slopes driven to the rise.

Coal bed.—No. 7. Cretaceous age; Mesaverde formation. The bed is 7 feet thick, clear coal.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented the entire thickness of the 7-foot bed and was taken in room 23.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 266.

ROCK SPRINGS. UNION PACIFIC NO. 10 MINE.

Sample.—Bituminous coal; Rock Springs field; (Wyoming No. 5) analyses Nos. 3164, 3165, 5360 (pp. 312, 313).

Mine.—Union Pacific No. 10; a slope mine in sec. 25, T. 19 N., R. 105 W., 1½ miles northeast of Rock Springs, on the Union Pacific Railroad.

Coal bed.—The bed worked at this mine is known as the Rock Springs, or No. 7, and has been so designated by the United States Geological Survey. It is of Cretaceous age, Mesaverde formation. At this mine the bed is slightly inclined, dipping about 15° NW. The coal averages 7 feet 6 inches thick, and the cover is about 500 feet thick. The roof is a hard gray shale. The floor is the same. The bed carries only one regular parting, a layer of sandstone 2 feet from the top that varies from $\frac{1}{16}$ inch to 1 foot thick.

The bed was measured and sampled at two points in the mine by J. W. Groves on April 20, 1906, as shown below:

Sections of coal bed in Union Pacific No. 10 mine, 1½ miles northeast of Rock Springs.

Section	A		B	
Laboratory No.	3164		3165	
	Ft.	*in.*	*Ft.*	*in.*
Roof, shale.				
Coal	0	3	2	1
Shale [a]	0	$\frac{1}{16}$	..	..
Sandy shale [a]	..	..	0	$\frac{1}{8}$
Coal	7	3	5	1
Floor, shale.				
Thickness of bed	7	$6\frac{1}{16}$	7	$2\frac{1}{8}$
Thickness of coal sampled	7	6	7	2

[a] Not included in sample.

Section A (sample 3164) was measured in room 41 in entry 5, 5,200 feet north of the slope.

Section B (sample 3165) was measured in room 76 in entry 4, 7,000 feet north of the slope.

The bed was also measured and sampled on September 17, 1907, by A. R. Schultz. The sample (No. 5360) was taken from a 5¾-foot cut of clear coal. It was taken in room 11, off north entry 6.

Notes.—The output of this mine was used for locomotive supply, steam production, and domestic purposes, and was distributed to various points along the railroad.

For results of tests of this coal, see mention of specific tests as follows—producer-gas tests: U. S. Geol. Survey Bull. 332, p. 286; Bureau of Mines Bull. 13, pp. 225, 277; coking tests: U. S. Geol. Survey Bull. 332, p. 287; Bull. 336, pp. 26, 35, 45.

For chemical analyses see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 332, p. 286; Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 259.

ROCK SPRINGS. BLAIRTOWN MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6772 (p. 313).

Mine.—Blairtown. A slope mine, in the NW. ¼ NW. ¼ sec. 2, T. 18 N., R. 105 W., 1 mile southwest of Rock Springs, on the Union Pacific Railway.

Coal bed.—No. 3. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 10, 1908, by B. L. Johnson. The sample included 5 feet 4 inches of clear coal. It was taken from the end of entry, 1,100 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 312; also U. S. Geol. Survey Bull. 381, p. 242.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 271.

Rock Springs. Old No. 6 Mine.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 6042, 6773 (p. 313).

Mine.—Old No. 6 mine; 3 miles north of Rock Springs in the NE. ¼ SE. ¼ sec. 22, T. 19 N., R. 105 W.

Coal bed.—No. 6. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 17, 1907, by A. R. Schultz and on November 10, 1908, by B. L. Johnson, as shown below:

Sections of coal bed in Old No. 6 mine 3 miles north of Rock Springs.

Laboratory No.	6773		6042	
	Ft.	*in.*	*Ft.*	*in.*
Coal	1	2	..	..
Bone	[a] 0	6	..	..
Coal	2	1	3	0
Shale	[a] 1	6	0	¼
Coal	1	6	3	3¾
Coal, bony	[a] 0	5	..	..
Coal	1	11	..	..
Thickness of bed	9	1	6	4
Thickness of coal sampled	6	8	6	4

[a] Not included in sample.

Sample 6773 was taken from main slope, 300 feet from entrance to mine. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 341, p. 271.

Rock Springs. Nos. 3, 4, and 5 Mines.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5364, 5365, 5366 (p. 313).

Mines.—Nos. 3, 4, and 5; in sec. 11, T. 18 N., R. 105 W., 3 miles south of Rock Springs, on the Union Pacific Railway.

Coal bed.—No. 7. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in September and October, 1907, by A. R. Schultz, as described below:

Sections of coal bed in Nos. 3, 4, 5 mines near Rock Springs.

Mine No.	5		4		3	
Laboratory No.	5365		5366		5364	
	Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	7	9	2	3	0	7½
Shale [a]	..	..	[a] 0	½	0	¼
Coal	..	..	3	11½	4	6¾
Thickness of bed	7	9	6	3	5	2½
Thickness of coal sampled	7	9	6	2½	5	2½

[a] Not included in sample.

Sample 5366 was taken in room 2, No. 4 mine.

Sample 5365 was taken in room 5, off No. 2 dip slope, back entry, of No. 5 mine.

Sample 5364 was taken at end of entry 5 of No. 3 mine, and represented part of a 12-foot bed that was mined.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 341, p. 270.

Rock Springs. Prospect Pit.

Sample.—Bituminous coal; Southern Rock Springs field; analysis No. 6771 (p. 313).

Location.—Prospect pit; 3 miles southwest of Rock Springs, in the NE. ¼ SE. ¼ sec. 4, T. 18 N., R. 105 W.

Coal bed.—The bed is Tertiary age, Wasatch formation, Black Rock group. The bed is about 8 feet 5 inches thick, with several bone partings.

The bed was sampled on November 10, 1908, by B. L. Johnson, as shown below:

Section of coal bed in prospect pit, 3 miles southwest of Rock Springs.

Laboratory No	6771	
	Ft.	*in.*
Coal	2	7
Bone [a]	0	1
Coal	3	8
Bone [a]	0	2
Coal	0	8
Bone [a]	0	2
Coal	1	1
Thickness of bed	8	5
Thickness of coal sampled	8	0

[a] Not included in sample.

The sample was taken 50 feet from the entrance of the mine.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 245.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 236.

Rock Springs. Prospect Pit.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6775 (p. 313).

Mine.—Prospect pit east of Interstate mine (local); in the NE. ¼ SE. ¼ sec. 10, T. 19 N., R. 105 W., 3½ miles north of Rock Springs.

Coal bed.—The bed is Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1908 by John L. Rich, as described below:

Section of coal bed in prospect pit near Rock Springs.

Laboratory No	6775	
	Ft.	*in.*
Coal	0	8½
Clay [a]	0	½
Coal	3	9
Thickness of bed	4	6
Thickness of coal sampled	4	5½

[a] Not included in sample.

Sample taken in mine, 100 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 243.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 231.

Rock Springs. Interstate Mine.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6774 (p. 313).

Mine.—Interstate; 3½ miles north of Rock Springs, in the SW. ¼ SE. ¼ sec. 10, T. 19 N., R. 105 W.

Coal bed.—Interstate. Tertiary age, Wasatch formation, Black Rock group. The bed is 6 feet 8 inches thick with two bone partings.

The bed was measured and sampled on November 9, 1908, by B. L. Johnson as shown on the following page.

Section of coal bed in Interstate mine, 3½ miles north of Rock Springs.

Laboratory No	6774	
	Ft.	*in.*
Coal	3	10
Bone[a]	0	2
Coal	0	7
Bone[a]	0	1
Coal	2	0
Thickness of bed	6	8
Thickness of coal sampled	6	5

[a] Not included in sample.

The sample was taken at point 54 feet west and 40 feet south of opening.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 245.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 236.

ROCK SPRINGS. KAPPES MINE.

Sample.—Bituminous (?) coal; Rock Springs field; analysis No. 6791 (p. 313).

Mine.—Kappes; in the SE. ¼ SW. ¼ sec. 14, T. 17 N., R. 105 W., 10 miles south of Rock Springs. No railroad connection.

Coal bed.—The bed is Cretaceous age, Mesaverde formation. Thickness, 4 feet.

The bed was measured and sampled by A. R. Schulz in 1908. The sample included 3½ feet of clear coal. It was taken in mine 40 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 243.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 228.

ROCK SPRINGS. KENT MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6799 (p. 313).

Mine.—Kent; in the NE. ¼ NE. ¼ sec. 14, T. 17 N., R. 105 W., 10 miles south of Rock Springs.

Coal bed.—The bed is Cretaceous age, Mesaverde formation. Roof, shale; floor, sandstone.

The bed was measured and sampled by A. R. Schulz in 1908. The sample included 3 feet 6 inches of clear coal. It was taken in south entry, 75 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 242.

ROCK SPRINGS. PROSPECTS.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5372, 5373 (p. 313).

Location.—Prospects; in the SW. ¼ SE. ¼ sec. 34, T. 21 N., R. 104 W., 11 miles northeast of Rock Springs. No railroad connection.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 1, 1907, by A. R. Schultz.

Sample 5372 was taken 30 feet in prospect where the coal bed measured 4 feet 8 inches.

Sample 5373 was taken 6 feet in another prospect pit where the coal measured 4 feet in thickness.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 341, p. 271.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 262.

ROCK SPRINGS. PROSPECT PIT.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 5367 (p. 313).

Location.—Prospect pit; in the SE. ¼ NE. ¼ sec. 30, T. 21 N., R. 104 W., 12 miles north of Rock Springs. No railroad connection.

Coal bed.—No name. Tertiary age; Wasatch formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 1 foot 6 inches of coal. In order to procure sample, 3 feet of weathered coal was removed. The sample was probably slightly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 341, p. 272.

ROCK SPRINGS. MILLER MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6796 (p. 313).

Mine.—Miller; in the NW. ¼ NW. ¼ sec. 24, T. 17 N., R. 105 W., 12 miles south of Rock Springs. No railroad connection.

Coal bed.—The bed is of Cretaceous age, Mesaverde formation.

The bed was measured and sampled on October 26, 1908, by A. R. Schultz, as described below:

Section of coal bed in Miller mine, 12 miles south of Rock Springs.

Laboratory No	6796	
	Ft.	in.
Coal	1	0
Parting [a]	0	½
Coal	2	5½
Thickness of coal bed	3	6
Thickness of coal sampled	3	5½

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 242.

ROCK SPRINGS. MENKINNEY MINE.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 6794 (p. 313).

Mine.—Menkinney; in the NW. ¼ SW. ¼ sec. 13, T. 15 N., R. 105 W., 23 miles south of Rock Springs. No railroad connection.

Coal bed.—The bed is Tertiary age, Wasatch formation. The bed dips 5°.

The bed was measured and sampled on September 29, 1908, by A. R. Schultz, as described below:

Section of coal bed in Menkinney mine, 23 miles south of Rock Springs.

Laboratory No	6794	
	Ft.	in.
Coal	2	6
Clay [a]	0	9
Coal	2	2
Thickness of bed	4	9
Thickness of coal sampled	4	8

[a] Not included in sample.

For chemical analyses of this coal see part I of this bulletin, p. 313; also U. S. Geol. Survey Bull. 381, p. 245.

For geologic relations see U. S. Geol. Survey Bull. 381, p. 238.

SUPERIOR. SUPERIOR C MINE.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5596, 5695, 7474 (p. 314).

Mine.—Superior C. A slope mine in sec. 20, T. 21 N., R. 102 W., near Superior, on the Union Pacific Railroad. The room-and-pillar system was employed, the rooms being driven up the rise. Timbers were used in all rooms and in entries where the roof was shale. A coal roof was left in many of the entries. The coal was undermined and all shot down in the rooms.

Coal bed.—No. 1. The coal is of Cretaceous age, Mesaverde formation. Thickness, 4¾ to 9½ feet; dip, 30°; roof, sandy shale; floor, bone and shale.

The bed was measured and sampled at two points on October 29, 1907, by V. H. Barnett, as described below:

Sections of coal bed in Superior C mine near Superior.

Laboratory No	5596		5695	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	6	2	0
Bone [a]	0	2	0	2
Coal	0	5	6	0
Bone [a]	0	5	..	..
Coal	3	10	..	..
Thickness of bed	7	4	8	2
Thickness of coal sampled	6	9	8	0

[a] Not included in sample.

Sample 5596 was taken in entry 1, 1,400 feet from mouth of mine.

Sample 5695 was taken in main entry of mine 1,845 feet from entrance.

The bed was also measured and sampled at one point in the mine by G. S. Rice, on February 14, 1909, as shown below:

Section of coal bed in Superior C mine near Superior.

Laboratory No	7474	
Roof, sandy shale.	*Ft.*	*in.*
Coal	1	6
Black shale [a]	0	2
Coal	6	0
Black shale lense [a]	0	3
Coal	0	4
Floor, bone or shale.		
Thickness of bed	8	3
Thickness of coal sampled	7	10

[a] Not included in sample.

The sample was taken from face of room 1, off north level 4, 1,500 feet northeast of drift mouth.

Notes.—The coal is a hard, tough coal. The principal use is for locomotive coal on the Union Pacific Railroad and for domestic fuel along the lines of the Union Pacific Railroad from Omaha to San Francisco. The output of this mine was about 1,000 tons a day at time of sampling.

For chemical analyses of this coal see part I of this bulletin, p. 314; also U. S. Geol. Survey Bull. 341, pp. 270, 278.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 278.

SUPERIOR. SUPERIOR D MINE.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5598, 5786 (p. 314).

Mine.—Superior D; a drift mine in sec. 20, T. 21 N., R. 102 W., at Superior, on the Union Pacific Railroad. The mine is driven on the strike of the coal. The rooms are timbered, and in the entries a coal roof is left.

Coal bed.—No. 1. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on October 29, 1907, by A. R. Schultz and on November 2, 1907, by V. H. Barnett, as shown below:

Sections of coal bed in Superior D mine at Superior.

Laboratory No.	5598		5786	
	Ft.	*in.*	*Ft.*	*in.*
Coal	6	0	6	4
Bone [a]	0	2	0	2
Coal	2	0	1	8
Thickness of bed	8	2	8	2
Thickness of coal sampled	8	0	8	0

[a] Not included in sample.

Sample 5598 was taken in mine, 380 feet from entrance.

Sample 5786 was taken in main entry of mine, 400 feet from entrance.

Notes.—The output was about 300 tons per day. The coal was used wholly by the Union Pacific Railroad. The Rock Springs coal, as a locomotive fuel or steam coal, has few superiors in the West. It operates under a forced draft without heavy sparking and is a quick steamer, leaving but little ash.

For chemical analyses of this coal see part I of this bulletin, p. 314; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 279.

SUPERIOR. PROSPECT.

Sample.—Bituminous coal; Rock Springs field; analysis No. 6043 (p. 314).

Location.—Prospect; on west side of valley in sec. 20, T. 21 N., R. 102 W., at Superior. No railroad connection.

Coal bed.—No. 3. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on December 10, 1907, by A. R. Schultz. The sample represented 7 feet of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 314; also U. S. Geol. Survey Bull. 341, p. 271.

SUPERIOR. SUPERIOR A MINE.

Sample.—Bituminous (?) coal; Rock Springs field; analyses Nos. 5926, 5928, 7475 (p. 314).

Mine.—Superior A; a slope mine in sec. 27, T. 21 N., R. 102 W., ¾ mile southeast of Superior, on the Union Pacific Railroad.

Coal beds.—No. 1 and No. 7. Cretaceous age, Mesaverde formation. The No. 1 bed is 250 feet above the No. 7.

The No. 7 bed was measured and sampled by A. R. Shultz, in 1907, and by G. S. Rice, on February 14, 1909, as shown below:

Sections of coal bed in Superior A mine, ¾ mile southeast of Superior.

Laboratory No.	7475		5928	
Roof, strong, shaly sandstone.	*Ft.*	*in.*	*Ft.*	*in.*
Bone [a]	0	1½	..	..
Coal	0	10	2	11
Shale	0	¼	0	3
Coal	5	4	4	0
Floor, hard shale.				
Thickness of bed	6	3¾	7	2
Thickness of coal sampled	6	2¼	6	11

[a] Not included in sample.

Sample 5928 was taken in main entry, 1,000 feet from entrance.

Sample 7475 was taken from face of dip room off north entry 2, 800 feet northeast of entrance.

The No. 1 bed was measured and sampled in 1907 by A. R. Schultz, as shown below:

Section of No. 1 coal bed in Lower A mine, southeast of Superior.

Laboratory No	5926	
	Ft.	*in.*
Coal	2	0
Parting [a]	0	¼
Coal	4	6
Thickness of bed	6	6¼
Thickness of coal sampled	6	6

[a] Not included in sample.

Sample 5926 was taken in entry No. 2.

Notes.—The coal is a hard, tough coal. The principal use was for locomotive coal on the Union Pacific Railroad and for domestic fuel along the lines of the Union Pacific Railroad from Omaha to San Francisco. The output of the Superior A mine was 300 to 400 tons a day.

For chemical analyses of the coal see part I of this bulletin, pp. 314, 315, also U. S. Geol. Survey Bull. 341, p. 270.

For other mention of this mine see U. S. Geol. Survey Bull. 341, pp. 259, 277–278.

SUPERIOR. PROSPECTS.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5597, 5599 (p. 314).

Location.—Prospects; in the NE. ¼ NE. ¼ sec. 10, T. 21 N., R. 102 W., 2 miles north of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The beds in the prospects were measured and sampled on October 28, 1907, by V. H. Barnett, as shown below:

Sections of coal beds in two prospects, 2 miles north of Superior.

Laboratory No	5597		5599	
	Ft.	*in.*	*Ft.*	*in.*
Coal	2	4	1	4
Clay [a]	0	¼	0	2
Coal	3	10	3	10
Clay [a]	0	1½	0	1½
Coal	1	1	1	1
Thickness of bed	7	4¾	6	6½
Thickness of coal sampled	6	3	5	3

[a] Not included in sample.

Sample 5597 was taken in prospect, 60 feet from entrance.

Sample 5599 was taken from another prospect, 50 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 314; also U. S. Geol. Survey Bull. 341, p. 272.

SUPERIOR. B MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 10067 (p. 315).

Mine.—B mine; in sec. 29, T. 21 N., R. 102 W., 2 miles northeast of Superior.

Coal bed.—No. 1. The coal is of Cretaceous age, Mesaverde formation.

The bed was measured and sampled by W. D. Brennan on February 17, 1910. The sample represented 100 inches, near face of air course, the point at which sample was taken.

Note.—The daily capacity of the mine at time of sampling was 1,200 tons.

For chemical analyses of this coal see part I of this bulletin, p. 315.

SUPERIOR. SUPERIOR B MINE.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5785 (p. 315).

Mine.—Superior B; 2 miles south of Superior, in sec. 28, T. 21 N., R. 102 W., on the Union Pacific Railroad.

Coal bed.—No. 7. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 6 feet of clear coal. It was taken in mine, 120 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 314; also U. S. Geol. Survey Bull. 341, p. 270.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 259.

SUPERIOR. PROSPECT PITS.

Sample.—Bituminous coal; Rock Springs field; analyses Nos. 5698, 5696 (p. 315).

Location.—Prospect pits; in sec. 3, T. 21 N., R. 103 W., 5 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation. The bed was measured and sampled on October 25 and November 2, 1907, by V. H. Barnett, as shown below:

Sections of coal bed in prospect, 5 miles northwest of Superior.

Laboratory No.	5698		5696	
	Ft.	*in.*	*Ft.*	*in.*
Coal	4	0	[a] 4	0
Parting	0	¼	..	..
Coal	4	0	6	0
Thickness of bed	8	¼	10	0
Thickness of coal sampled	8	¼	6	0

[a] Not included in sample.

Sample 5698 was taken in prospect, 270 feet from entrance.

Sample 5696 was taken in prospect, 90 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, pp. 270, 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5348 (p. 315).

Location.—Prospect pit; in Pine Canyon, in sec. 24, T. 22 N., R. 103 W., 6 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz, as shown below:

Section of coal bed in prospect pit, 6 miles northwest of Superior.

Laboratory No.	5348	
	Ft.	*in.*
Coal	0	2
Parting [a]	0	1½
Coal	4	6
Clay [a]	0	3
Coal	2	8
Parting [a]	0	1
Coal	1	6
Thickness of bed	9	3½
Thickness of coal sampled	7	10

[a] Not included in sample.

The sample was taken in prospect, 15 feet from entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5697 (p. 315).

Location.—Prospect; in sec. 9, T. 21 N., R. 103 W., 6½ miles northeast of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on September 23, 1907, by V. H. Barnett. The sample represented 6 feet 9 inches of clear coal. The sample was taken in prospect, 250 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5699 (p. 315).

Location.—Prospect; in the NW. ¼ sec. 8, T. 21 N., R. 103 W., 7 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on October 28, 1907, by V. H. Barnett. The sample represented 5 feet 4 inches of clear coal. It was taken in prospect, 100 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5694 (p. 315).

Location.—Prospect; in the SE. ¼ sec. 5, T. 21 N., R. 103 W., 7½ miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on October 28, 1907, by V. H. Barnett, as shown below:

Section of coal bed in prospect, 7½ miles northwest of Superior.

Laboratory No	5694	
	Ft.	*in.*
Coal	5	0
Coal[a]	1	0
Thickness of bed	6	0
Thickness of coal sampled	5	0

[a] Not included in sample.

The sample was taken in prospect, 150 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 270.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5371 (p. 315).

Location.—Prospect pit; in sec. 12, T. 21 N., R. 104 W., 8 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on August 27, 1907, by V. H. Barnett. The sample represented 4 feet 5 inches of clear coal. It was obtained in prospect, 10 feet from entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5950 (p. 315).

Location.—Prospect pit; in the NE. ¼ NE. ¼ sec. 6, T. 22 N., R. 103 W., 9 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz, as shown on the following page.

Section of coal bed in prospect, 9 miles northwest of Superior.

Laboratory No	5950 *Ft. in.*
Coal	2 6
Parting[a]	0 1½
Coal	1 2
Parting[a]	0 2½
Coal	2 0
Thickness of bed	6 0
Thickness of coal sampled	5 8

[a] Not included in sample.

The sample was taken in prospect, 20 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5376 (p. 315).

Location.—Prospect pit; in sec. 34, T. 21 N., R. 104 W., 9 miles southwest of Superior. No railroad connection.

Coal bed.—The bed is Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 5 feet of coal. It was taken in prospect, 20 feet from entrance. The upper part of the bed only was available, the lower part being in water. The sample was wet and probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5370 (p. 315).

Location.—Prospect; in sec. 23, T. 21 N., R. 104 W., 9 miles west of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 4 feet of clear coal. The sample was obtained in prospect, 20 feet from entrance. Eight inches of weathered coal was removed before sample was cut, but the sample was probably somewhat weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5353 (p. 315).

Location.—Prospect; in Pine Canyon in the NE. ¼ NE. ¼ sec. 6, T. 22 N., R. 103 W., 10 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz, as shown below:

Section of coal bed in prospect pit, 10 miles northwest of Superior.

Laboratory No	5353 *Ft. in.*
Coal[a]	3 9
Shale[a]	3 0
Coal	4 10
Coal[a]	5 2
Thickness of bed	16 9
Thickness of coal sampled	4 10

[a] Not included in sample.

The sample was taken in prospect, 20 feet from entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5347 (p. 315).

Location.—Prospect; in Pine Canyon in the NE. ¼ NE. ¼ sec. 6, T. 22 N., R. 103 W., 11 miles northwest of Superior.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz, as shown below:

Section of coal bed in prospect pit, 11 miles northwest of Superior.

Laboratory No	5347	
	Ft.	*in.*
Coal	2	6
Shale [a]	0	1½
Coal	1	2
Shale [a]	0	2½
Coal	2	0
Thickness of bed	6	0
Thickness of coal sampled	5	8

[a] Not included in sample.

The sample was obtained in prospect, 20 feet from entrance. The coal was weathered.

For chemical analyses of this coal, see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5349 (p. 315).

Location.—Prospect; in NE. ¼ NE. ¼ sec. 6, T. 22 N., R. 103 W., 11 miles northwest of Superior.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz, as shown below:

Section of coal bed in prospect pit, 11 miles northwest of Superior.

Laboratory No	5349	
	Ft.	*in.*
Coal	4	0
Parting [a]	0	1½
Coal	1	0
Parting [a]	0	1
Coal	0	10
Thickness of bed	6	½
Thickness of coal measured	5	10

[a] Not included in sample.

The sample was taken in prospect, 20 feet from entrance. The coal was weathered.

For chemical analyses of this coal, see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5368 (p. 315).

Location.—Prospect; in the SE. ¼ NW. ¼ sec. 14, T. 21 N., R. 104 W., 11 miles west of Superior.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1907 by V. H. Barnett. The sample represented 7 feet 10 inches of coal, which was overlain with shale and underlain with sandstone. The sample was taken in the prospect, 100 feet from entrance.

For chemical analyses of this coal, see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

For geologic relations, see U. S. Geol. Survey Bull. 341, p. 262.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5369 (p. 315).

Location.—Prospect; in the SE. ¼ SE. ¼ sec. 10, T. 21 N., R. 104 W., 11½ miles west of Superior.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled on August 27, 1907, by V. H. Barnett. The sample represented 3 feet of clear coal. It was taken in prospect, 20 feet from entrance. The coal was weathered.

For chemical analyses of this coal, see part I of this bulletin, p. 315; also U. S. Geol. Survey Bull. 341, p. 271.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5350 (p. 316).

Location.—Prospect; in the NE. ¼ SE. ¼ sec. 34, T. 22 N., R. 104 W., 12 miles northwest of Superior.

Coal bed.—No name. Cretaceous age; Mesaverde formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 4 feet 6 inches of clear coal. It was taken in the prospect, 40 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal, see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 5375 (p. 316).

Location.—Prospect; in the SW. ¼ NE. ¼ sec. 17, T. 21 N., R. 104 W., 12 miles west of Superior.

Coal bed.—No name. Tertiary age, Wasatch formation.

The bed was measured and sampled in 1907 by A. R. Schultz. The sample represented 4 feet of clear coal.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 272.

Sample.—Subbituminous coal; Rock Springs field; analysis No. 5374 (p. 316).

Location.—Prospect pit; in the NW. ¼ SE. ¼ sec. 29, T. 21 N., R. 104 W., 12½ miles west of Superior.

Coal bed.—No name. Tertiary age, Wasatch formation.

The bed was measured and sampled by A. R. Schultz in 1907. The sample represented the entire bed, 5 feet 6 inches thick.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 272.

For geologic relations see U. S. Geol. Survey Bull. 341, p. 264.

SUPERIOR. HOOTEN PROSPECT.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5804 (p. 316).

Location.—Hooten prospect; in sec. 21, T. 23 N., R. 103 W., 13 miles northwest of Superior. No railroad connection.

Coal bed.—Crookston. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 11, 1907, by A. R. Schultz. The sample represented 5 feet of clear coal. The sample was taken in the prospect, 60 feet from entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 271.

SUPERIOR. HOOTEN MINE.

Sample.—Subbituminous coal; Rock Springs field; analyses Nos. 5802, 5803 (p.316).

Mine.—Hooten; in sec. 24, T. 23 N., R. 104 W., 15 miles northwest of Superior. No railroad connection.

Coal bed.—No name. Tertiary age, Wasatch formation.

The bed was measured and sampled on November 11, 1907, by A. R. Schultz.

Sample 5802 included a 5-foot cut of coal taken from the upper bench of an 8-foot bed.

Sample 5803 included a 3-foot cut of coal taken from the lower bench of 8-foot bed.

The samples were taken in the mine, 65 feet from entrance. The coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 272.

SWEETWATER. SWEETWATER MINE.

Sample.—Bituminous coal; Rock Springs field; (Denver No. 33) analyses Nos. 946–D, 945–D (p. 316).

Mine.—Sweetwater; a drift mine at Sweetwater, on the Union Pacific Railroad.

Coal bed.—No. 7. The bed is Cretaceous age. Thickness, fairly uniform; roof, shale; floor, sandstone.

The bed was measured and sampled at two points, as described below:

Section of coal bed in Sweetwater mine at Sweetwater.

Section	A		B	
Laboratory No.	946–D		945–D	
	Ft.	*in.*	*Ft.*	*in.*
Roof, sandy shale.				
Coal	1	11	1	11
Shale	0	¼	0	¼
Coal	3	11¾	4	¾
Floor, sandstone.				
Thickness of bed	5	11	6	0
Thickness of coal sampled	5	11	6	0

Section A (sample 945–D) was measured in entry 10, approximately 1½ miles north of the drift.

Section B (sample 946–D) was measured in room off entry 4½, 1½ miles north of the drift.

Note.—The rated capacity of the mine at time of sampling was 1,200 tons per day.

For results of tests of this coal, see mention of specific tests as follows—washing tests: Bureau of Mines Bull. 5, p. 32; coking tests: Bureau of Mines Bull. 5, p. 57.

For chemical analyses of this coal see part I of this bulletin, p. 316.

SYCAMORE. OUTCROP.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5813 (p. 316).

Location.—Outcrop in railroad cut in the SE. ¼ SW. ¼ sec. 23, T. 20 N., R. 102 W., near Sycamore. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 21, 1907, by V. H. Barnett. The sample included 4 feet of coal, which was overlain and underlain with shale. The sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 271.

SYCAMORE. OUTCROP.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5809 (p. 316).

Location.—Outcrop; in sec. 29, T. 20 N., R. 102 W., 1 mile west of Sycamore. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 20, 1907, by V. H. Barnett. The sample represented 2 feet 4 inches of coal, which was overlain and underlain with shale. The sample was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 316; also U. S. Geol. Survey Bull. 341, p. 271.

SYCAMORE. PROSPECT PIT.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5814 (p. 317).

Location.—Prospect pit; in sec. 16, T. 20 N., R. 102 W., 3 miles northeast of Sycamore. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 15, 1907, by V. H. Barnett. The sample represented 3 feet 6 inches of clear coal. It was taken in the prospect, 5 feet from entrance. The coal was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 341, p. 271.

SYCAMORE. PROSPECT PIT.

Sample.—Bituminous coal; Rock Springs field; analysis No. 5812 (p. 317).

Location.—Prospect pit; in sec. 18, T. 20 N., R. 102 W., 3 miles northwest of Sycamore. No railroad connection.

Coal bed.—No name. Cretaceous age, Mesaverde formation.

The bed was measured and sampled on November 15, 1907, by V. H. Barnett. The sample represented 1 foot 7 inches of coal, which was overlain with clay and underlain with shale. The sample was taken in the prospect, 6 feet from entrance. The coal was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 341, p. 271.

UINTA COUNTY.

ALMY. NO. 5 MINE.

Sample.—Subbituminous coal; Kemmerer field; analysis No. 2325 (p. 317).

Mine.—No. 5; at Almy, in the SE. ¼ sec. 30, T. 16 N., R. 120 W., on the Oregon Short Line Railroad.

Coal bed.—Main Almy. Cretaceous or Tertiary age, Evanston formation.

The bed was measured and sampled in 1905 by A. C. Veatch. The sample represented the lower 8 feet of a 24-foot bed. The upper part of the bed contains numerous partings. The sample was taken in room 5, off entry 12, 3,000 feet from mouth of mine.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Prof. Paper 56, p. 135; Bull. 285, p. 339.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 339.

ALMY. MICHIGAN-WYOMING MINE.

Sample.—Subbituminous coal; Kemmerer field; analysis No. 2326 (p. 317).

Mine.—Michigan-Wyoming; in the NW. ¼ sec. 33, T. 17 N., R. 120 W., 7 miles north of Almy. No railroad connection.

Coal bed.—No name. Cretaceous or Tertiary age, Evanston formation.

The bed was measured and sampled in 1905 by A. C. Veatch, as shown below:

Section of coal bed in Michigan-Wyoming mine, 7 miles north of Almy.

Laboratory No	2326	
	Ft.	in.
Coal	0	6
Bone[a]	0	1
Coal	0	11
Bone[a]	0	4
Coal	2	2
Thickness of bed	4	0
Thickness of coal sampled	3	7

[a] Not included in sample.

The sample was taken in mine, 40 feet from entrance.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Prof. Paper 56, p. 136; Bull. 285, p. 339.

BONDURANT. PROSPECTS.

Sample.—Bituminous coal; Snake River field; analysis No. 3892 (p. 317).

Location.—Prospect; in the NW. ¼ NE. ¼ sec. 31, T. 38 N., R. 113 W., 2 miles southwest of Bondurant. No railroad connection.

Coal bed.—Fall River. Cretaceous or Tertiary age, Evanston formation.

The bed was measured and sampled on September 22, 1906, by A. R. Schultz. The sample represented 1 foot of coal, which was overlain and underlain with shale.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Subbituminous (?) coal; Snake River field; analysis No. 3893 (p. 317).

Location.—Prospect; in the NW. ¼ SE. ¼ sec. 31, T. 38 N., R. 113 W., 2½ miles southwest of Bondurant. No railroad connection.

Coal bed.—Fall River. Cretaceous age, "Laramie" formation.

The bed was measured and sampled on September 22, 1906, by A. R. Schultz. The sample represented 3 feet of coal, which was underlain and overlain with shale. The prospect was shallow, and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4303 (p. 317).

Location.—Prospect pit; on Willow Creek in the NW. ¼ NW. ¼ sec. 33, T. 37 N., R. 115 W., 13 miles southwest of Bondurant.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled in 1906 by A. R. Schultz, as shown below:

Section of coal bed in prospect, 13 miles southwest of Bondurant.

Laboratory No	4303	
	Ft.	*in.*
Coal, dirty [a]	2	10
Coal	2	8
Thickness of bed	5	6
Thickness of coal sampled	2	8

[a] Not included in sample.

The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4300 (p. 317).

Location.—Prospect pit; on Willow Creek in the NE. ¼ NE. ¼ sec. 32, T. 37 N., R. 115 W., 14 miles southwest of Bondurant. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled in 1906 by A. R. Schultz. The sample included a 2-foot cut of coal, below which was 3 feet 6 inches of coal and shale. The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4006 (p. 317).

Location.—Prospect; in the SE. ¼ SW. ¼ sec. 32, T. 37 N., R. 115 W., 15 miles southwest of Bondurant. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on October 2, 1906, by E. E. Smith. The sample represented a 2½-foot cut of coal, which was overlain with sandstone. The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4005 (p. 317).

Location.—Prospect; in the NW. ¼ NE. ¼ sec. 11, T. 36 N., R. 116 W., 15½ miles southwest of Bondurant.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on October 1, 1906, by A. R. Schultz, as shown below:

Section of coal bed in prospect, 15½ miles southwest of Bondurant.

Laboratory No	4005	
Roof, shale.	*Ft.*	*in.*
Coal [a]	1	2
Shale [a]	8	0
Coal	2	3
Floor, shale.		
Thickness of bed	11	5
Thickness of coal sampled	2	3

[a] Not included in sample.

The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

Sample.—Bituminous coal; Snake River field; analysis No. 4299 (p. 317).

Location.—Prospect; on Willow Creek, in the SW. ¼ NE. ¼ sec. 11, T. 36 N., R. 116 W., 16 miles southwest of Bondurant. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation. The bed is 6 feet thick, including three partings which aggregate 18 inches in thickness. The position of these partings in the section is unknown.

The bed was measured and sampled in 1906 by A. R. Schultz.

The sample included a 4½-foot cut and was taken in the prospect, 100 feet from entrance. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 239.

Sample.—Bituminous coal; Snake River field; analysis No. 4003 (p. 317).

Location.—Prospect; in the SW. ¼ SE. ¼ sec. 1, T. 37 N., R. 116 W., 16 miles west of Bondurant. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on September 27, 1906, by E. E. Smith, as shown below:

Section of coal bed in prospect, 16 miles west of Bondurant.

Laboratory No	4003	
	Ft.	*in.*
Coal and shale [a]	1	0
Clay [a]	1	6
Coal	3	0
Clay [a]	0	1
Thickness of bed	5	7
Thickness of coal sampled	3	0

[a] Not included in sample.

The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4302 (p. 317).

Location.—Prospect; on Willow Creek, in the SW. ¼ SE. ¼ sec. 1, T. 37 N., R. 116 W., 16 miles west of Bondurant. No railroad connection.

Coal bed.—The bed is Cretaceous age, Frontier formation.

The bed was measured and sampled in 1906 by A. R. Schultz. The sample included a 2-foot cut of coal, which was underlain by 1½ feet of dirty coal. The prospect was shallow and the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 317; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, pp. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4301 (p. 318).

Location.—Prospect; in the SW. ¼ SE. ¼ sec. 1, T. 37 N., R. 116 W., 16 miles west of Bondurant. No railroad connection.

Coal bed.—Upper Frontier. Cretaceous age; Frontier formation. Bed 39 inches thick, including 7 inches of parting. Parting was excluded from sample; its location in the bed was not recorded.

The bed was measured and sampled in 1906 by A. R. Schultz. The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4001 (p. 318).

Location.—Prospect; in the NW. ¼ NE. ¼ sec. 11, T. 36 N., R. 116 W., 17 miles west of Bondurant. No railroad connection.

Coal bed. Not named. Cretaceous age; Frontier formation.

The bed was measured and sampled on October 20, 1906, by A. R. Schultz, as shown below:

Section of coal bed in prospect, 17 miles west of Bondurant.

Laboratory No.	4001	
Roof, sandstone.	*Ft.*	*in.*
Coal	2	0
Shale [a]	0	5
Coal	1	4
Floor, shale.		
Thickness of bed	3	9
Thickness of coal sampled	3	4

[a] Not included in sample.

The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

Sample.—Bituminous coal; Snake River field; analysis No. 4323 (p. 318).

Location.—Prospect; in T. 36 N., R. 118 W., 25 miles southwest of Bondurant. No railroad connection.

Coal bed.—Not named. Cretaceous age; Frontier formation.

The bed was measured and sampled in 1906 by A. R. Schultz. The sample represented 3 feet of clear coal. The prospect sampled was shallow and the coal included in the sample was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

CUMBERLAND. CUMBERLAND NO. 1 MINE.

Sample.—Bituminous coal; Kemmerer field; analysis No. 2245 (p. 318).

Mine.—Cumberland No. 1; 1 mile west of Cumberland, in the NE. ¼ SW. ¼ sec. 31, T. 19 N. R. 116 W., on the Oregon Short Line Railway.

Coal bed.—Main Kemmerer. Cretaceous age; Frontier formation.

The bed was measured and sampled in 1905 by A. C. Veatch. The sample represented 8 feet of clear coal. It was taken in south entry 7, 2,100 feet west and 2,000 feet south of mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Prof. Paper 56, p. 136; Bull. 285, p. 339.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, pp. 116, 124.

DIAMONDVILLE. NO. 1 MINE.

Sample.—Bituminous coal; Kemmerer field; analysis No. 2284 (p. 318).

Mine.—No. 1; at Diamondville in sec. 25, T. 21 N., R. 116 W., on the Oregon Short Line Railway.

Coal bed.—Main Kemmerer. Cretaceous age; Frontier formation.

The bed was measured and sampled in 1905 by A. C. Veatch, as shown below:

Section of coal bed in No. 1 mine at Diamondville.

Laboratory No	2284	
	Ft.	*in.*
Coal	1	0
Clay [a]	0	4
Coal	5	8
Thickness of bed	7	0
Thickness of coal sampled	6	8

[a] Not included in sample.

The sample was taken in room 45, off the first north entry, 160 feet west and 3,460 feet north of the mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Prof. Paper 56, p. 136; Bull. 285, p. 339.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, p. 121.

FRONTIER. KEMMERER NO. 1 MINE.

Sample.—Bituminous coal; Kemmerer field; analyses Nos. 2286, 2287 (p. 318).

Mine.—Kemmerer No. 1, at Frontier, in the SE. ¼ NW. ¼ sec. 12, T. 21 N., R. 116 W., on the Oregon Short Line Railway.

Coal beds.—Lower or A and Main Kemmerer. Cretaceous age; Frontier formation.

The bed was measured and sampled in 1905 by A. C. Veatch, as shown below:

Section of Kemmerer No. 1 mine at Frontier.

Laboratory No	2286	
	Ft.	*in.*
Coal	2	0
Dirt [a]	0	6
Coal	4	0
Thickness of bed	6	6
Thickness of coal sampled	6	0

[a] Not included in sample.

Sample 2286 was taken from the Lower or A bed, 850 feet from mine entrance.

Sample 2287 was taken from the Main Kemmerer bed, in room 46, off south entry 3, 600 feet west and 2,850 feet south of mine mouth. The sample included a 9-foot cut of coal.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Prof. Paper 56, p. 136.

For geologic relations see U. S. Geol. Survey Bull. 285, p. 339; Prof. Paper 56, p. 120.

FRONTIER. WILLOW CREEK OPENING.

Sample.—Bituminous coal; Kemmerer field; analysis No. 2285 (p. 318).

Location.—Willow Creek opening; in the SW. ¼ NW. ¼ sec. 19, T. 22 N., R. 115 W., 5 miles north of Frontier. No railroad connection.

Coal bed.—Willow Creek. Cretaceous age, Frontier formation.

The bed was measured and sampled in 1905 by A. C. Veatch. The sample represented 3 feet of clear coal. It was taken at end of main entry, 150 feet from mine mouth.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Prof. Paper 56, p. 136; Bull. 285, p. 339.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, p. 120.

FRONTIER. WILLOW CREEK MINE.

Sample.—Bituminous coal; Kemmerer field; analysis No. 3572 (p. 318).

Mine.—Willow Creek; in the SW. ¼ NW. ¼ sec. 2, T. 23 N., R. 116 W., 12 miles north of Frontier. No railroad connection.

Coal bed.—No name. Cretaceous age, Frontier formation.

The bed was measured and sampled on November 17, 1906, by A. R. Shultz. The sample included 6 feet 5 inches of coal which was overlain and underlain with shale.

For chemical analyses of this coal see part I of this bulletin, p. 318; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 226.

JACKSON. SURFACE PROSPECT.

Sample.—Bituminous (?) coal; Snake River field; analysis No. 4002 (p. 319).

Location.—Surface prospect; on the east side of Snake River, south of Game Creek, 6 miles south of Jackson, in the SW. ¼ NE. ¼ sec. 34, T. 40 N., R. 116 W. No railroad connection.

Coal bed.—Not named. Geologic age and formation unknown.

The bed was measured and sampled on October 8, 1906, by A. R. Schultz. The sample represented 1 foot 5 inches of coal, which was overlain with shale and underlain with clay. The prospect was shallow and the coal sampled was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 229.

KEMMERER. ADAVILLE MINE.

Sample.—Subbituminous coal; Kemmerer field; (Wyoming No. 6) analyses Nos. 3202, 3203, 2283 (p. 319).

Mine.—Adaville, a drift mine, 3 miles west of Kemmerer, in the NE. ¼ SW. ¼ sec. 20, T. 21 N., R. 116 W., on the Union Pacific Railroad.

Coal bed.—The bed worked at this mine is of Cretaceous age, "Laramie" formation. The bed is 83 feet thick and dips west about 30 feet in 100.

No complete section of the bed was obtained. Sections were measured and sampled by J. W. Groves on May 3, 1906, at two points in the mine.

Sample 3202 was taken from rooms 1 and 2, 150 feet north of the drift opening, where the worked section of the bed was 12 feet thick.

Sample 3203 was taken from rooms 7 and 8, 180 feet north of the drift opening, where the worked section of the bed was 11 feet thick.

The two samples together represent about 23 feet of the bed. The bed itself is said to be clean coal through its thickness of 83 feet.

The bed was also sampled and measured in 1905 by A. C. Veatch. The sample (2283) was taken from an 84-foot bed, and represents less than half the thickness of the bed. The coal was uniform with no partings. The sample was obtained by taking fragments of coal at intervals along an entry that was driven diagonally through the bed.

Notes.—The coal produced at this mine, like that from other mines in the district, is a black lignite, and had been used by locomotives, by manufacturing plants, and for domestic purposes. At the time the samples were collected the mine was being cleaned out after having been abandoned for several years.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Bull. 332, p. 288; Bureau of Mines Bull. 23, pp. 70, 189; producer-gas tests: U. S. Geol. Survey Bull. 332, p. 288; Bureau of Mines Bull. 13, pp. 225, 277; briquetting tests: U. S. Geol. Survey Bull. 332, p. 289.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Prof. Paper 56, p. 136; Bull. 285, p. 339; Bull. 332, p. 287.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, p. 131.

MERNA. PROSPECT.

Sample.—Bituminous coal; Snake River field; analysis No. 3891 (p. 319).

Mine.—Prospect; a drift mine on MacDougal Mountain in the NW. ¼ SE. ¼ sec. 33, T. 34 N., R. 115 W., 14 miles west of Merna. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on September 7, 1906, by A. R. Schultz. The sample represented 6 feet 2 inches of coal, which was underlain and overlain with shale. The sample was taken in the prospect, 20 feet from entrance. The coal was fresh.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

MERNA. LANDER PEAK SURFACE PROSPECT.

Sample.—Bituminous coal; Snake River field; analysis No. 3778 (p. 319).

Location.—Lander Peak surface prospect; in the SE. ¼ SE. ¼ sec. 34, T. 33 N., R. 115 W., 18 miles southwest of Merna. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on September 6, 1906, by E. E. Smith. The sample represented 2 feet of coal which was overlain with sandstone and underlain with shale. The prospect was shallow and the sample included weathered coal.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

MERNA. WYOMING RANGE PROSPECT.

Sample.—Bituminous (?) coal; Snake River field; analysis No. 3890 (p. 319).

Location.—Prospect; in the NW. ¼ SE. ¼ sec. 2, T. 34 N., R. 116 W., 19 miles west of Merna. No railroad connection.

Coal bed.—The bed is of Cretaceous age, Frontier formation.

The bed was measured and sampled on September 12, 1906, by A. R. Schultz. The sample represented 10 feet 2 inches of coal, which was overlain with shale. The prospect was shallow and the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

MERNA. SURFACE PROSPECT.

Sample.—Bituminous (?) coal; Snake River field; analysis No. 4004 (p. 319).

Location.—Surface prospect; near southwest corner of tract in NE. ¼ NW. ¼ sec. 35, T. 35 N., R. 116 W., 19½ miles west of Merna. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on October 4, 1906, by A. R. Schultz. The sample represented 4 feet of coal, which was overlain with sandstone. The prospect was shallow and the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

MERNA. SURFACE PROSPECT.

Sample.—Bituminous coal; Snake River field; analysis No. 4000 (p. 319).

Location.—Surface prospect; in Wyoming range, near northwest corner of tract, in the NE. ¼ NW. ¼ sec. 35, T. 35 N., R. 116 W., 20 miles west of Merna. No railroad connection.

Coal bed.—Not named. Cretaceous age, Frontier formation.

The bed was measured and sampled on October 4, 1906, by A. R. Schultz. The sample represented 6 feet of coal, which was overlain with sandstone. The prospect was shallow and the coal was badly weathered.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

SPRING VALLEY. RICHARDSON MINE.

Sample.—Bituminous coal; Kemmerer field; analysis No. 2212 (p. 319).

Mine.—Richardson; in the NW. ¼ sec. 12, T. 15 N., R. 118, 3½ miles northeast of Spring Valley.

Coal bed.—Spring Valley. Cretaceous age, Frontier formation. Bed is 5 feet thick Roof, gray clay.

The bed was measured and sampled in 1905 by A. C. Veatch, as shown below:

Section of coal bed in Richardson mine, 3½ miles northeast of Spring Valley.

Laboratory No	2212	
Roof, gray shale.	*Ft.*	*in.*
Coal	2	3
Shale[a]	0	2
Coal	2	7
Thickness of bed	5	0
Thickness of coal sampled	4	10

[a] Not included in sample.

The sample was taken 150 feet west and 50 feet north of opening.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Prof. Paper 56, p. 136.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, p. 65.

Spring Valley. Lazeart Mine.

Sample.—Subbituminous coal; Kemmerer field; analysis No. 2211 (p. 319).

Mine.—Lazeart; in the SE. ¼ SW. ¼ sec. 8, T. 15 N., R. 118 W., 4 miles northwest of Spring Valley. No railroad connection.

Coal beds.—Adaville. Cretaceous age, Adaville formation.

The bed was measured and sampled in 1905 by A. C. Veatch. The sample included a 13-foot cut of coal, which was underlain with 17 feet of coal. The sample was taken in mine, 15 feet from mouth. The coal was probably weathered.

For chemical analyses of this coal see part I of this bulletin, p. 319; also U. S. Geol. Survey Prof. Paper 56, p. 136. Bull. 285, p. 339.

For geologic relations see U. S. Geol. Survey Prof. Paper 56, p. 720.

Stanley. Prospect Pit.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3695 (p. 320).

Location.—Prospect pit; in the NE. ¼ NW. ¼ sec. 1, T. 28 N., R. 114 W., 8 miles south of Stanley and about 12 miles north of Viola.

Coal bed.—Not named. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 26, 1906, by A. R. Schultz. The sample included 2½ feet of coal, which was overlain with shaly sandstone and underlain with shale. The coal sampled was weathered.

Notes.—The coal was mined for local use. On exposure to the air it slacks readily.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

Stanley. Prospect Drift.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3700 (p. 320).

Location.—Prospect drift in the SW. ¼ NW. ¼ sec. 1, T. 28 N., R. 114 W., 8½ miles south of Stanley and about 12 miles north of Viola. No railroad connection.

Coal bed.—Not named. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 26, 1906, by A. R. Schultz. The sample included 3¼ feet of coal, which was overlain with sandstone and underlain with shale. The sample was taken at end of drift, 210 feet from entrance.

Notes.—The coal was mined for local use; on exposure to air, it slacks readily.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

Stanley. Prospect.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3694 (p. 320)

Location.—Prospect pit; in the SE. ¼ SE. ¼ sec. 12, T. 28 N., R. 114 W., 9 miles south of Stanley, and about 12 miles north of Viola.

Coal bed.—Not named. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 28, 1906, by A. R. Schultz. The sample included 4 feet 2 inches of clear coal. The prospect was shallow and the coal was badly weathered.

Notes.—The coal was mined for local use. It slacks readily on exposure to air.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

Stanley. Griggs Prospect.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3699 (p. 320).

Location.—Griggs prospect; in the SE. ¼ SE. ¼ sec. 12, T. 28 N., R. 114 W., 9 miles south of Stanley and about 12 miles north of Viola.

Coal bed.—Labarge Mountain. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 26, 1906, by A. R. Schultz. The sample represented 8 feet of coal, which was overlain with shale. The sample was taken in the prospect, 125 feet from entrance. The coal was probably weathered.

Notes.—The coal was mined for local use. When exposed to the air it slacks readily.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 228.

Viola. Sayley Mine.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3698 (p. 320).

Mine.—Sayley; in the SE. ¼ NW. ¼ sec. 7, T. 26 N., R. 113 W., about 2 miles northeast of Viola.

Coal bed.—No name. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 28, 1906, by A. R. Schultz. The sample represented 6 feet of coal, which was overlain with shale and underlain with sandstone. The sample was taken in prospect, 180 feet from entrance. The coal was probably weathered.

Notes.—The coal was mined for local use. It slacks readily when exposed to air.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 227.

Viola. Prospect Pit.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3693 (p. 320).

Location.—Prospect pit; in the SE. ¼ SW. ¼ sec. 32, T. 27 N., R. 113 W., about 4 miles northeast of Viola.

Coal bed.—Not named. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 28, 1906, by A. R. Schultz, as shown below:

Section of coal bed in prospect pit, 4 miles northeast of Viola.

Laboratory No	3693	
Roof, shale.	*Ft.*	*in.*
Coal	8	3
Shale [a]	3	2
Coal [a]	3	0
Floor, shale.		
Thickness of bed	14	5
Thickness of coal sampled	8	3

[a] Not included in sample.

Notes.—The coal slacks readily when exposed to the air. It was mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 227.

VIOLA. SURFACE OPENING.

Sample.—Subbituminous coal; Labarge Mountain field; analysis No. 3697 (p. 320).

Location.—Surface opening; in the SW. ¼ NE. ¼ sec. 29, T. 27 N., R. 113 W., about 5 miles northeast of Viola.

Coal bed.—Labarge Mountain. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 28, 1906, by A. R. Schultz. The sample represented 3½ feet of coal, which was overlain and underlain with shale. The prospect was shallow and the coal was weathered.

Notes.—The coal slacks readily when exposed to air. It was mined only for local use.

For chemical analyses of this coal see part I of this bulletin, p. 320; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 227.

VIOLA. PROSPECT PIT.

Sample.—Subbituminous coal; Kemmerer field; analysis No. 3696 (p. 320).

Location.—Prospect pit; in the SW. ¼ SW. ¼ sec. 17, T. 25 N., R. 115 W., about 12 miles southwest of Viola.

Coal bed.—No name. Cretaceous age, Adaville formation.

The bed was measured and sampled on August 28, 1906, by A. R. Schultz. The sample represented 3 feet of coal, which was overlain with shale. The prospect was shallow and the coal was weathered.

For chemical analyses of this coal see part I of this bulletin, p. 320: also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 227.

VIOLA. PROSPECT PIT.

Sample.—Bituminous coal; Kemmerer field; analysis No. 3570 (p. 321).

Location.—Prospect pit; in the NE. ¼ SE. ¼ sec. 16, T. 25 N., R. 115 W., about 11 miles southwest of Viola.

Coal bed.—Willow Creek. Cretaceous age; Frontier formation.

The bed was measured and sampled on November 17, 1906, by A. R. Schultz. The sample represented 4¼ feet of coal, which was overlain and underlain with shale.

For chemical analyses of this coal see part I of this bulletin, p. 321; also U. S. Geol. Survey Bull. 316, pp. 232, 236.

For geologic relations see U. S. Geol. Survey Bull. 316, p. 227.

WESTON COUNTY.

CAMBRIA. ANTELOPE NO. 1 AND NO. 3 AND JUMBO MINES.

Sample.—Bituminous coal; Black Hills region; (Wyoming No. 2) analyses Nos. 1376, 1377 (p. 321).

Mine.—Antelope Nos. 1 and 3 and Jumbo mines, all delivering coal to one tipple; drift openings in sec. 29, T. 46 N., R. 61 W., at Cambria, on a branch line of the Burlington & Missouri River Railroad.

Coal bed.—The coal occurs in the Lakota sandstone, near the base of the Cretaceous system. It is probably a local bed, limited to this general locality. Thickness, variable; dip, slight; roof, sandstone, in places underlain with black shale; floor, clay.

The bed was measured and sampled at four points by F. W. deWolf, in 1904, as described below:

Sections of coal bed in Antelope Nos. 1 and 3 and Jumbo mines at Cambria.

Section	A		B		C		D	
Laboratory No.	1376		1377		1376			
Roof: Secs. A, C, and D, sandstone; sec. B, black shale.	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
Coal	2	0	..	..	..	..	..	..
Coal (cannel?)	..	..	0	2	..	..	..	..
Shale, black	..	..	..	..	0	4	..	..
Shale	..	..	..	..	..	..	0	3
Coal, splint	0	7	..	..	..	..	..	..
Coal	..	..	0	2	..	..	..	..
Clay [a]	..	..	..	..	1	5	..	..
Bone	..	..	..	..	..	..	1	7
Coal	0	6	..	..	..	..	..	..
Coal, splint	..	..	0	7	..	..	0	2¾
Bone	..	..	..	..	0	3	..	..
Coal, splint	0	2	..	..	..	..	..	..
Coal	..	..	0	10	..	..	..	..
Clay [a]	..	..	..	..	1	0	..	..
Clay	..	..	..	..	..	..	0	1
Coal	1	10	..	..	1	5	2	9
Clay [a]	..	..	0	1½	..	..	..	..
Coal, splint	0	10	..	..	..	..	..	..
Coal	..	..	0	3	..	..	..	..
Sulphur [a]	..	..	..	..	0	½	..	..
Coal	0	6	..	..	1	2¼	..	..
Coal, splint	0	3	0	5	..	..	..	..
Coal	..	..	1	2½	..	..	..	..
Clay [a]	..	..	..	..	0	3	..	..
Coal, splint	..	..	0	3	..	..	..	..
Coal	..	..	0	4	1	8½	..	..
Clay [a]	..	..	0	2	..	..	..	..
Coal	..	..	1	0	..	..	..	..
Floor, fire clay.								
Thickness of bed	6	8	5	6	7	7¼	4	10¾
Thickness of coal sampled	6	8	5	2½	4	10¾	..	..

[a] Not included in sample.

Section A was measured in room 6, off northwest entry 3, in Antelope No. 3 mine; section B (sample 1377) was measured in room 9, off northwest entry 8, in Jumbo mine; section C was measured in room 7, off northwest entry, in Antelope No. 1 mine; and section D was measured in room 14 in Antelope No. 1 mine. Sample No. 1376 was composed of cuttings from sections A and C. No sample was taken at section D.

Notes.—The coal was largely used as engine coal by the Burlington & Missouri River Railroad. The slack coal (that passing through ½-inch screen) was generally coked at the mine, yielding a coke high in ash. In 1904 about 30 per cent of the output was slack.

For results of tests of this coal, see mention of specific tests as follows—steaming tests: U. S. Geol. Survey Prof. Paper 48, p. 937; Bull. 261, p. 83; Bull. 290, p. 225; Bureau of Mines Bull. 23, pp. 70, 188; producer-gas tests: U. S. Geol. Survey Prof. Paper 48, p. 1304; Bull. 261, p. 115; Bull, 290, p. 226; Bureau of Mines Bull. 13, pp. 223, 277.

For chemical analyses of this coal see part I of this bulletin, p. 321; also U. S. Geol. Survey Prof. Paper 48, p. 263; Bull. 261, p. 59; Bull. 290, p. 225.

HORTON. HOLWELL PROSPECTS NOS. 1 AND 2.

Sample.—Bituminous coal; Black Hills field; analyses Nos. 6747, 6743, 6744, 6746 (p. 321).

Location.—Holwell prospect Nos. 1 and 2; in the SE. ¼ sec. 31, T. 48 N., R. 62 W.; 7 miles west of Horton and about 20 miles northwest of the Chicago, Burlington & Quincy Railroad at Cambria.

Coal bed.—At the base of the Lakota sandstone of Lower Cretaceous age.

The bed in Holwell prospect No. 1 was measured and sampled by R. W. Stone and C. T. Lupton, as shown below:

Section of coal bed at Holwell prospect No. 1, 7 miles west of Horton.

	Ft.	in.
Bone	1	2
Coal, bituminous, with dull and bright streaks	2	0
Coal, bituminous, bright	0	7
Coal, cannel	1	6
Coal, bituminous, bright	1	9
Coal, cannel	1	4
Coal, bony, shaly	0	8
Thickness of bed	9	0

The prospect was a drift about 55 feet long, which had not been worked for a number of years. The sample was taken at the breast and although representing as fresh coal as could be obtained by cleaning the surface, it was probably slightly weathered. The analyses represent the various parts of the bed as follows:

Sample 6747 represented whole thickness of bed. It was taken 55 feet in.

Sample 6743 represented 18 inches of cannel coal in the middle part of the bed. The sample was taken 55 feet in.

Sample 6744 represented 14 inches of bone at the top of bed. The sample was taken at end of entry 1.

Sample 6746 represented 7-inch and 21-inch benches of bright and cannel coal mixed.

The bed in Holwell prospect No. 2 was measured and sampled by R. W. Stone, as shown below:

Section of coal bed in Holwell prospect No. 2, 7 miles west of Horton.

Laboratory No	6745	
	Ft.	in.
Bone	0	6
Bone, with streaks of bituminous coal	1	1
Coal, bright, bituminous	0	3
Coal, bony	0	8½
Coal, bright, bituminous	0	2½
Coal, dull, bituminous	0	5½
Coal, cannel	0	5
Coal, bony	0	1½
Coal, bright, bituminous	0	9
Coal, splint	1	0
Bone	0	6
Thickness of bed	6	0
Thickness of coal sampled	5	0

This prospect was a single drift 95 feet long, which had not been worked for several months. The sample, taken at the face, represented the whole thickness of the bed, and probably included only slightly weathered coal.

Notes.—The coal for the most part is bituminous, and some of the benches would coke.

For chemical analyses of this coal see part I of this bulletin, p. 321.

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INDEX.

This index gives the names of places at or near which the samples of coal mentioned in this bulletin were collected. In addition, it gives the names of many coal beds, including names of geological significance as well as some that are merely local, and the names of most of the mines.

Attention is called to the fact that many beds opened by prospect pits, country banks, or even mines, especially beds in the Rocky Mountain province, have no names, even local ones. Moreover, such local names as "A," "B," "1," "2," "Upper," "Lower," have been omitted in the case of beds that have not been correlated with other beds similarly designated in the same State, the purpose in omitting such names being to reduce the length of the index and to avoid the confusion that would result from applying the same designation to different beds. Mines that in the text have no other title than a number, as "Mine No. 1," are not included, for similar reasons.

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